PHEGEA

driemaandelijks tijdschrift van de
VLAAMSE VERENIGING VOOR ENTOMOLOGIE

Afgiftekantoor 2170 Merksem 1 — ISSN 0771-5277
Periode: september – oktober – noverber 2019 — Erkenningsnr. P209674

Redactie: S. Cuvelier (Ieper), Dr. L. De Bruyn (Antwerpen), G. De Prins (Antwerpen), W. O. De Prins (Leefdaal), T. C. Garrevoet (Antwerpen), B. Goater (Chandlers Ford, England), Dr. A. Legrain (Hermalle-sous-Argenteau), Dr. K. Martens (Brussel), T. Sierens (Gent).
Redactie-adres: Zoë Vanstraelen, Westerwennel 15, 3600 Genk (Belgium).
phegea.vve@gmail.com

www.phegea.org

Jaargang 47, nummer 4
1 december 2019

Anastassiu H.T. & Intzidou C.: *Carcharodus alceae* (Lepidoptera: Hesperiidae, Pyrginae) active at night 74

Wullaert S. & Meert R.: *Acroclita subsequana* (Lepidoptera: Tortricidae), new to the Belgian fauna 80

Zerganipour A., Esfandiari M., Naderi A. & Rabieh M.M.: Identification of the butterflies (Lepidoptera, Papilionoidea) in the IMCA (Insect and Mite Collection of Ahvaz) at Shahid Chamran University of Ahvaz, Khuzestan, Iran 87

Meert R. & Nossent R. *Impatiens glandulifera* as a commonly used host plant for *Pristerognatha fuligana* (Lepidoptera: Tortricidae) in Belgium 90

PHEGEA

Carcharodus alceae (Lepidoptera: Hesperiidae, Pyrginae) active at night

Hristos T. Anastassiu & Chryssanthi Intzidou

Abstract. Nocturnal activity of *Carcharodus alceae* is documented for the first time. A specimen of this butterfly was observed while flying around a regular terrace lamp in Halkidikí, Northern Greece in a warm summer night. Photographs were taken at the time and are shown here.

Samenvatting. Een nachtelijke activiteit van *Carcharodus alceae* wordt hier voor het eerst in de literatuur gedocumenteerd. De vlinder werd vliegend rond een terraslamp waargenomen te Halkidikí, Noord-Griekenland tijdens een warme zomernacht. Foto's werden ter plaatse genomen en hier afgebeeld.

Résumé. Une activité nocturne de *Carcharodus alceae* est documentée ici pour la première fois dans la littérature. Le papillon a été observé lors qu'il volait autour d'une lampe de terrace à Halkidikí, Grèce septentrional. Des photos, prises à l'endroit, sont présentées ici.

Key words: Hesperiidae – Pyrginae – *Carcharodus alceae* – nocturnal activity – Greece – Halkidikí.

Anastassiu H. T.: International Hellenic University, Dept. of Informatics, Computer and Communications Engineering, End of Magnisias Str., GR-62124 Sérres, Greece. hristosa@teiser.gr

Intzidou C.: Lake Kerkini Management Authority, Lake Kerkini National Park, GR-62055 Kerkini/Kato Poroia. Greece. intzidou@kerkini.gr

Introduction

Nocturnal activity of butterflies is rather unusual, and has been documented in a few scientific papers in the past as a curiosity. Most of the observations have been made in the tropics, e.g. in Chowdhury & Soren (2011), which is a review of relevant studies in India. In that article, 27 species of Indian butterfly were reported to have been attracted to artificial light between 1951 and 2011. Similarly, DeVries *et al.* (1987), recorded synchronous nocturnal activity and gregarious roosting in the Neotropical skipper *Celaenorrhinus fritzgaertneri* (Bailey, 1880). Sourakov & Houlihan (2017) subsequently documented nocturnal activity in another Hesperiid, namely *Pseudonascus paulliniae* (Sepp, [1842]) in French Guiana. In that paper the similarity in the eye structure of Hesperiidae and Sphingidae is emphasized, and the possibility of entirely nocturnal habits of certain skipper species is discussed.

In Europe, analogous observations are rare, presumably because of the very different climatic conditions; there is one paper describing such activity in Andorra by Roche (1990) and two reports from Bulgaria: Abadjiev (1993) and Beshkov (1998), where a total of twelve butterfly and five day-flying moth species are reported as being attracted to light traps. Most of these incidents took place at mercury vapour lamps with a power ranging from 125 W to 400 W.

Fig. 1. *Carcharodus alceae* sitting on a wall near a lantern © H. Anastassiu.

Fig. 1. *Carcharodus alceae* rustend op een muur nabij een lantaarn © H. Anastassiu.

The reasons of this relatively unusual phenomenon are not clearly understood. The effects of artificial lighting to the behaviour of diurnal Lepidoptera are exhaustively studied in Seymoure (2018). Thermoregulatory hypotheses for such findings are proposed in Beshkov (1998), but without proof.

The case of *Carcharodus alceae* (Esper, [1780])

On August 24, 2018, at approximately 10 p.m., a specimen of *Carcharodus alceae* was observed to be sitting on a wall close to a terrace lantern, equipped with a regular 75 W lamp (figs. 1 & 2). The exact location was Pefkochórion, in the prefecture of Halkidikí, region of Kentrikí Makedonía, Greece, alt. 0 m, in a garden 50 m from the beach. The temperature was 25 °C and the skies were clear at the time. The authors intentionally disturbed the butterfly in order to watch its subsequent behaviour. As anticipated, it spiralled around the lantern for a while, closely resembling a moth, and then landed on the lantern shade (fig. 3). In general, it was very reluctant to leave the area, and it was still sitting at the same spot when checked again in the morning. Finally, when the sun warmed the terrace sufficiently, the skipper took off and disappeared in the neighbouring lawn. It did not return to the lantern the following nights.

This is the first report in the literature of such activity of this particular species, especially for a lamp of medium illumination capacity, as opposed to a high powered light trap. Moreover, it is the first time in more than 30 years that a diurnal Lepidopteron has been found to be active at night at this particular place, where the first author annually spends his summer vacation. The small number

 ISSN 0771-5277

of scientific articles related to such behaviour and our inadequate understanding of several parameters affecting it, implies that further relevant research needs to be conducted in the future.

Fig. 2. Close look of a *Carcharodus alceae* sitting on a wall near a lantern © H. Anastassiu.
Fig. 3. *Carcharodus alceae* sitting on the shade of a lantern, after being disturbed off the wall © H. Anastassiu.
Fig. 2. Een dichtbij-opname van een *Carcharodus alceae* rustend op een muur nabij een lantaarn © H. Anastassiu.
Fig. 3. *Carcharodus alceae* rustend op een lantaarnkap, na verstoring op de muur © H. Anastassiu.

References

Abadjiev S. 1993. Butterflies in a light trap (Lepidoptera, Papilionoidea). — *Phegea* **21**(1): 27.

Beshkov S. 1998. Butterflies and day-flying moths in light traps (Lepidoptera). — *Phegea* **26**(3): 118–120.

Chowdhury S. & Soren R. 2011. Light attracted butterflies: A review from the Indian sub-region with an inventory from West Bengal, India. — *Journal of Threatened Taxa* **3**: 1868–1871.

DeVries P. J., Schull J. & Greig N. 1987. Synchronous nocturnal activity and gregarious roosting in the neotropical skipper butterfly *Celaenorrhinus fritzgaertneri* (Lepidoptera: Hesperiidae). — *Zoological Journal of the Linnean Society* **89**: 89–103.

Roche P. 1990. A satyrid butterfy in a light trap. — *Entomologist's Record and Journal of Variation* **102**: 114.

Seymoure B. M. 2018. Enlightening Butterfly Conservation Efforts: The Importance of Natural Lighting for Butterfly Behavioral Ecology and Conservation. — *Insects* **9** (22): 1–25.

Sourakov A. & Houlihan P.R. 2017. Note on nocturnal activity of a skipper, *Pseudonascus paulliniae* in French Guiana. — *Tropical Lepidoptera Research* **27** (1): 26–27.

Acroclita subsequana (Lepidoptera: Tortricidae), new to the Belgian fauna

Steve Wullaert & Ruben Meert

Abstract. During a survey in "The Doornpanne" in Koksijde (WV) a specimen of a tortricid was collected for further examination because it was not determinable in the field. After studying the genitalia it turned out to be *Acroclita subsequana* (Herrich-Schäffer, 1851), a new species for Belgium. In the following months, many larvae of this species were found at various locations on the west coast. In this article the distribution and the biology are discussed.

Samenvatting. Tijdens een nachtvlinderinventarisatie in "De Doornpanne" te Koksijde (WV) werd één exemplaar ingezameld omdat de vlinder in het veld niet te determineren was. Na studie van het genitaal bleek het te gaan om *Acroclita subsequana* (Herrich-Schäffer, 1851) (zeewolfsmelkbladroller), een nieuwe soort voor België. In de maanden daarna werden op verschillende locaties aan de westkust heel wat rupsen van deze soort gevonden. In dit artikel worden de verspreiding en de biologie besproken.

Résumé. Lors d'un inventaire à "De Doornpanne" à Koksijde (WV), un spécimen a été collecté car il n'était pas identifiable sur le terrain. Après examination des genitalia, il s'est avéré qu'il agissait d'*Acroclita subsequana* (Herrich-Schäffer, 1851), une nouvelle espèce pour la Belgique. Au cours des mois suivants, de nombreuses chenilles de cette espèce ont été trouvées à différents endroits sur la côte occidentale. Dans cet article la répartition et la biologie sont également discutées.

Key words: *Acroclita subsequana* – Faunistics – First record – Belgium.

Wullaert S.: Sint-Jorisstraat 24, 3583 Paal, Belgium – www.bladmineerders.be – sw.demijnen@gmail.com
Meert R.: Grote Snijdersstraat 75, 9280 Lebbeke; Belgium – ruben_meert@hotmail.com

Introduction

During a moth survey in "De Doornpanne" at Koksijde/Oostduinkerke (WV) on 30.ix.2018 the Working Group Leafminers of the Flemish Entomological Society found one specimen we could not determine immediately. We retained it, and after examination of the genitalia we found it was the first adult specimen captured in Belgium of *Acroclita subsequana* (Herrich-Schäffer, 1851), det. and gen. prep. SW.: PRE.SW.2275.18.F. KDO.24, leg. SW, CS & WM. During 2018, four visits were made to that particular area and about 3500 specimens from 329 different species were recorded (Wullaert 2019). Among the Lepidoptera, there were many species that require coastal habitats. "De Doornpanne" is an extensive dune landscape of which the central part is owned by the Intercommunal Water Supply Company of Veurne-Ambacht (IWVA) and functions as a water collecting area. Other parts are managed by the Agency for Nature and Forests and most are designated as Flemish Nature Reserves. The area comprises various types of dune, from drift dunes and dune grasslands to densely grown pans and fixed inner dunes. The core of the dune complex consists of a broad depression in which the vegetation forms a mosaic of forest, scrub and open dune vegetation (iwva.be 2019). The capture of that one specimen led to a search of other coastal areas, and in most of them larvae of *A. subsequana* were found on *Euphorbia paralias* (sea spurge), one of it's hostplants. On the platform "waarnemingen.be" many observations of this species were reported. All data shown in Table 1 are from the Province of West Flanders and were extracted from waarnemingen.be (2019).

A closer look at these observations revealed that our capture of the moth in "De Doornpanne" was actually not the first observation of this species in Belgium. On checking their photos of larvae from coastal areas, other entomologists found that some of them were also of this species. The first observation was made in 2016, when the second author found one larva in "Ster Der Zee" at Koksijde on 08.x.2016. Two years later another was seen and photographed in "De Westhoek" at De Panne on 30.vi.2018, leg. SC (waarnemingen.be 2019). With so many subsequent observations of larvae along the Belgian coastline, it is clear that *Acroclita subsequana* is well established along the Belgian coast.

Abbreviations

For Provinces we use the same abbreviations as those used in "The Catalogue of the Lepidoptera of Belgium" (De Prins *et al.* 2019), so WV stands for West Flanders. IWVA: Intercommunale Waterleidingsmaatschappij van Veurne-Ambacht.

Abbreviations for specimens checked for genital structure are presented as follows: PRE.SW.2275.18.F. KDO.24, PRE = Preparation, SW = Steve Wullaert, 2275 = nr of preparation, 18 = year of preparation, F = female, KDO = Koksijde/Doorpanne, 24 = nr of preparation from that area.

Abbreviations for people are presented as follows: BDW = Bart De Witte, CG = Christophe Gruwier, CS = Chris Steeman, DDG = Davy De Groote, DG = Damien Gailly, ET = Eef Thoen, JD = Jurgen Dewolf, MW = Maarten Willems, PVM = Philippe Vanmeerbeeck, PV = Pieter Vantieghem, RM = Ruben Meert, RN = Regis Nossent, RR = Ruben Recour, SC = Stéphane Claerebout, SW = Steve Wullaert, WD = Wim Declercq and WM = Wouter Mertens.

 ISSN 0771-5277

Table 1. Observations of *Acroclita subsequana* in West Flanders.
Table 1. Waarnemingen van *Acroclita subsequana* in West-Vlaanderen.

Location	Specific area	Date	Life stage	Number	Leg.
Koksijde	Ster Der Zee (Koksijde)	08.x.2016	Caterpillar	1	RM
		07.x.2018	Caterpillar	10	RM
		16.xi.2018	Caterpillar	1	MW
		24.iii.2019	Caterpillar	1	MW
	De Doornpanne (Oostduinkerke)	30.ix.2018	Imago	1	SW, CS, WM
	Schipgatduinen (Oostduinkerke)	28.x.2018	Caterpillar	20	RN, RR
	Omgeving Zeedijk (Oostduinkerke)	19.iv.2019	Caterpillar	5	BDW
	Omgeving Gilles Scottlaan (Oostduinkerke)	11.v.2019	Caterpillar	1	WD
		22.vii.2019	Caterpillar	1	RM
	Omgeving Zeedijk (Koksijde)	05.x.2019	Caterpillar	3	RM
De Panne	De Westhoek (De Panne)	30.vi.2018	Caterpillar	1	SC
		19.x.2018	Caterpillar	150	CS, SW
		03.xi.2018	Caterpillar	2	PV, WD
		27.xii.2018	Caterpillar	1	RN, RR
		20.ii.2019	Caterpillar	1	RM
		09.iii.2019	Caterpillar	1	WD
	Vissersdorp (De Panne)	20.x.2018	Caterpillar	5	ET, JD, RN, WD
		28.x.2018	Caterpillar	10	CG
		03.xi.2018	Caterpillar	1	PV
	Omgeving sportstrand (De Panne)	21.x.2018	Caterpillar	7	DG
	Telpost Witte Berg (De Panne)	24.viii.2019	Caterpillar	10	PVM
Nieuwpoort	IJzermonding (Nieuwpoort)	21.x.2018	Caterpillar	2	DG
		31.viii.2019	Caterpillar	5	DG
	Strand Groenendijk (Nieuwpoort)	23.xii.2018	Caterpillar	2	WD
Oostende	Duinen Fort Napoleon (Oostende)	27.xii.2018	Caterpillar	1	WD
Middelkerke	Sint-Laureinsduinen (Westende)	15.ix.2019	Imago	3	DDG, ET

Fig. 1. Larva of *Acroclita subsequana* partially boring into stem of host plant – Koksijde (WV) 06.x.2018 © Ruben Meert.
Fig. 1. Deels in stengel van de waardplant borende rups van *Acroclita subsequana* – Koksijde (WV) 06.x.2018 © Ruben Meert.

Taxonomy

Tortricidae are among the largest and most diverse groups of Lepidoptera worldwide. To date, 10,387 species in 1,071 genera have been described (van Nieukerken *et al.* 2011). At present 389 species of Tortricidae have been recorded in Belgium (De Prins *et al.* 2019). Within the genus *Acroclita* Lederer, 1859 about 91 different species occur worldwide (Beccaloni *et al.* 2012), but in Belgium, A. subsequana is the only representative (De Prins *et al.* 2019). The four other European *Acroclita* species are restricted to the Canary Islands or Madeira (or both) (Aarvik 2017). Therefore, it seems very unlikely that other species of this genus will ever be found in Belgium.

Life cycle and biology

The eggs are deposited, usually singly, in May – June and again in August – September on leaves of *Euphorbia paralias* or *E. portlandica* (Portland spurge). The larvae feed in June and September – March on the leaves and seeds (Bland 2014). The small leaves are spun closely against the stem of the host plant, creating some sort of a tunnel or gallery in which the larva hides and feeds. The larval feeding on the leaf parenchyma causes a yellowish brown discoloration of the leaves, which is easy to detect (fig. 4). In some cases, some brown or nearly black frass can be found at the outside (fig. 5). Personal observations revealed that in some cases the larva bores partially into the upper part of the soft shoot of the host plant (fig. 1).

Fig. 2. Bred specimen of *Acroclita subsequana* on *Euphorbia paralias* (sea spurge) – Schipgatduinen ~ Oostduinkerke (WV). Larvae were found on 28.x.2018, adults were photographed on 01.xii.2018 © Regis Nossent.
Fig. 2. Uitgekweekt exemplaar van *Acroclita subsequana* op *Euphorbia paralias* (zeewolfsmelk) – Schipgatduinen ~ Oostduinkerke (WV). Rupsen werden gevonden op 28.x.2018, imago's werden gefotografeerd op 01.xii.2018 © Regis Nossent.

Fig. 3. Same specimen as in fig. 2 © Ruben Recour.
Fig. 3. Zelfde exemplaar als in fig. 2 © Ruben Recour.

Euphorbia portlandica, a coastal species, is native to Great Britain, Ireland, the Channel Islands and the Atlantic coasts of France, Spain and Portugal (Clapham *et al* 1987). As *A. portlandica* does not occur in Belgium, *E. paralias* must be the only host plant here. Larvae of the second generation hibernate on the host plant. Pupation takes place in April – May and July – August, in a cocoon in the larval habitation (Bland 2014). In breeding conditions at room temperature, some larvae, collected in October, pupated in the soil and produced adult moths in December (pers. comm. WD) (fig. 2 & 3). Adult moths are normally on the wing in April – June and July – August, flying from evening onwards. They are attracted to both sugar (Bland 2014) and light.

Field search tips

Because of its dull coloration and rapid flight, it is very difficult to capture or even follow an adult *A. subsequana* during its flight (Bland 2014). Therefore, it seems that searching for larvae is the best way to look for this species. Infested host plants are often recognisable from a distance by the discoloration of the galleries in which larvae are or have been feeding. Sometimes the whole plant looks quite devastated (Fig. 7).

Fig. 4. Typical feeding pattern from *Acroclita subsequana* on *Euphorbia paralias* (sea spurge) – Vissersdorp ~ De Panne (WV) 20.x.2018 © Wim Declercq.
Fig. 4. Typisch vraatbeeld van *Acroclita subsequana* op *Euphorbia paralias* (zeewolfsmelk) – Vissersdorp ~ De Panne (WV) 20.x.2018 © Wim Declercq.

Fig. 5. Typical feeding pattern from *Acroclita subsequana* on *Euphorbia paralias* (sea spurge) – Ster Der Zee ~ Koksijde (WV) 07.x.2018 © Ruben Meert.
Fig. 5. Typisch vraatbeeld van *Acroclita subsequana* op *Euphorbia paralias* (zeewolfsmelk) – Ster Der Zee ~ Koksijde (WV) 07.x.2018 © Ruben Meert.

Fig. 6. Larva of *Acroclita subsequana* on *Euphorbia paralias* (sea spurge) – Vissersdorp ~ De Panne (WV) 20.x.2018 © Wim Declercq.
Fig. 6. Rups van *Acroclita subsequana* op *Euphorbia paralias* (zeewolfsmelk) – Vissersdorp ~ De Panne (WV) 20.x.2018 © Wim Declercq.

Fig. 7. Infected host plant *Euphorbia paralias* (sea spurge) – Koksijde (WV) 06.x.2018 © Ruben Meert.
Fig. 7. Aangetaste voedselplant *Euphorbia paralias* (zeewolfsmelk) – Koksijde (WV) 06.x.2018 © Ruben Meert.

The polyphagous *Cacoecimorpha pronubana* (Hübner, [1799]) (Lepidoptera: Tortricidae) has also been bred from spun *Euphorbia paralias* leaves in Belgium by the second author, and it is therefore important to have a closer look at any larva found on this plant. Full grown larvae of *A. subsequana* have a light brown head (with a darker brown apicranium). The body is brownish yellow, tinged with light green. The pinacula are blackish. The prothoracic plate is brown, sometimes yellow brown, with some darker shades laterally and posteriorly. The medial sulcus is whitish and clearly visible. The thoracic legs are brown and the anal plate is yellowish brown (fig. 6). Those of *C. pronubana* are more variable, have green thoracic legs marked with brown and a green anal comb with usually four long and two (outer) prongs (Bland 2014).

Finally, *Lobesia* (*Lobesiodes*) *occidentis* Falkovitch, 1970 (Lepidoptera: Tortricidae) is also known to feed in loosely spun terminal leaves and to bore down into the shoot of *E. paralias* and some other *Euphorbia* species. The larvae of this species are dark green, with prothoracic and anal plates and the thoracic legs entirely black. This makes them easily distinguishable from both other species. *L. occidentis* is widely distributed in Europe (Aarvik 2017) and is locally present on the south-east coast of England (Bland 2014). So far, it is unknown in Belgium (De Prins *et al.* 2019).

Distribution

Acroclita subsequana is present in most parts of western and southern Europe: Britain, France, Spain (including the Canary Islands), Portugal (including the Selvagens Islands and Madeira), Italy (including Sardinia and Sicily) and Malta (Aarvik 2017) as well as in some coastal regions of Russia (Bland 2014). At the Belgian coast (WV) caterpillars were found between De Panne en Oostende (waarnemingen.be 2019). However, distribution maps of *Euphorbia paralias* show well established populations along the whole Belgian and Dutch coastline. These populations of suitable host plants should be monitored closely over the coming years, to see if *A. subsequana* is spreading northwards.

Acknowledgements

We would like to thank Bart Clarebout and Diederik d'Hert for the opportunity to make inventories in "De Doornpanne" where the first specimen was caught. We appreciate the collaboration of Stéphane Claerebout who corrected an earlier draft of this article. We would like to thank Damien Gailly for reading and correcting the French text. The photographers, Ruben Recour, Regis Nossent and Wim Declercq are thanked for the permission to use their photos.

References

Aarvik, L.E. 2017. Fauna Europaea: Tortricidae. – In: Karsholt, O. & Nieukerken, E.J. van (2017) Fauna Europaea: Lepidoptera, Moths. Fauna Europaea version 2017.06 — https://fauna-eu.org [accessed on 13.i.2019]

Bland K.P. 2014. *The moths and butterflies of Great Britain and Ireland. Volume 5: Tortricidae.* — Brill, Leiden, 622pp.

Beccaloni G., Scoble M., Kitching I., Simonsen T., Robinson G., Pitkin B., Hine A. & Lyal C. 2019. *LepIndex: The Global Lepidoptera Names Index (version 12.3, Jan 2012).* – In: Species 2000 & ITIS Catalogue of Life, 2019 Annual Checklist (Roskov Y., Ower G., Orrell T., Nicolson D., Bailly N., Kirk P.M., Bourgoin T., DeWalt R.E., Decock W., Nieukerken E. van, Zarucchi J., Penev L., eds.). — Digital resource at www.catalogueoflife.org/annual-checklist/2019. Species 2000: Naturalis, Leiden, the Netherlands. [accessed on 12.i.2019].

Clapham A.R., Tutin T.G. & Moore D.M. 1987. *Flora of the British Isles.* — Cambridge University Press, Cambridge, 691 pp.

De Prins W., Steeman C. &. Garrevoet T. 2019. Catalogue of the Lepidoptera of Belgium. 2003–2019. *Catalogue of the Lepidoptera of Belgium*. — https://projects.biodiversity.be/lepidoptera/ [accessed on 12.i.2019].

Iwva.be 2019. *Intercommunale Waterleidingsmaatschappij van Veurne-Ambacht. De Doornpanne (Koksijde/Oostduinkerke)* — https://www.iwva.be/bezoekers/natuurgebieden/de-doornpanne [accessed on 12 January 2019].

van Nieukerken E., Kaila L., Kitching I., Kristensen N.P., Lees D., Minet J., Mitter J., Mutanen M., Regier J., Simonsen T. Wahlberg N., Yen S.-H., Zahiri R., Adamski D., Baixeras J., Bartsch D. Bengtsson B. Å., Brown J.W., Bucheli S.R., Davis D.R., De Prins J., De Prins W., Epstein M.E., Gentili-Poole P., Gielis C., Hättenschwiler P., Hausmann A., Holloway J.D., Kallies A., Karsholt O., Kawahara A.Y., Koster S.J.C., Kozlov M.V., Lafontaine J.D., Lamas G., Laundry J.F. Lee S., Nuss M., Park K.-T., Penz C. Rota J., Schintlmeister A., B.C. Schmidt, Sohn J.-C., Solis M.A., Tarmann G.M., Warren A.D., Weller S., Yakovlev R.V., Zolotuhin V.V. & Zwick A. 2011. Order Lepidoptera Linnaeus, 1758. In: Zhang Z.-Q., editor. 2011. Animal Biodiversity: An outline of higher classification and survey of taxonomic richness.". — *Zootaxa* **3148**, pp. 212–221.

Waarnemingen.be 2019. Een initiatief van Natuurpunt Studie vzw en de Stichting Natuurinformatie. — www.waarnemingen.be [accessed on 16.x.2019].

Wullaert S. 2019. Vlaamse Vereniging voor Entomologie: Werkgroep Bladmineerders. — www.bladmineerders.be [accessed on 12.i.2019].

Identification of the butterflies (Lepidoptera, Papilionoidea) in the IMCA (Insect and Mite Collection of Ahvaz) at Shahid Chamran University of Ahvaz, Khuzestan, Iran.

Ahlam Zerganipour, Mehdi Esfandiari, Alireza Naderi & Mohammad Mahdi Rabieh

Abstract. Butterflies are with about 19,000 species one of the best-known groups of insects and include five families in Iran. In the present work, we studied the butterflies of the "Insect and Mite Collection of Ahvaz" located at the Department of Plant Protection, Shahid Chamran University of Ahvaz which dates back to 55 years ago. All butterfly species deposited in the collection were studied and identified. We examined wing patterns, genitalia, and in a few cases used DNA barcoding by means of standard primers (LepF1 & LepR1) for species identification. As a result, 82 species and subspecies belonging to Papilionidae (5 taxa), Hesperiidae (11 taxa), Lycaenidae (15 taxa), Pieridae (17 taxa) and Nymphalidae (34 taxa) were identified from 21 Iranian Provinces. Among them, 24 new provincial records were registered for the Provinces of Khuzestan (11), Ilam (4), Esfahan (3), Yazd (2), Lorestan, Bushehr, Khorasan-e Razavi and Kohgiluyeh-va Boyerahmad (1 each). Our results indicate that despite well-known information about butterflies in Iran, their local distribution maps and taxonomic status can be further supplemented and revised by conducting more research into explicit species diversity in each area.

Samenvatting. Een van de bekendste insectengroepen zijn de dagvlinders, waartoe zo'n 19 000 soorten behoren. In Iran komen vijf dagvlinderfamilies voor. In dit artikel bespreken we de studie van de dagvlinders uit de "insecten en mijten collectie van Ahvaz". Deze collectie, gehuisvest in het departement gewasbescherming van de "Shahid Chamran universiteit te Ahvaz" dateert van 55 jaar geleden en bevat specimens uit 21 Iraanse provincies. Alle vlinders in de collectie werden bestudeerd en gedetermineerd. Hiertoe werden de vleugelpatronen en genitalia onderzocht en in enkele gevallen maakten we gebruik van DNA barcoding met behulp van de standaard primers (LepF1 & LepR1). In totaal werden 82 soorten en ondersoorten gedetermineerd: Papilionidae (5 taxa), Hesperiidae (11 taxa), Lycaenidae (15 taxa), Pieridae (17 taxa) en Nymphalidae (34 taxa), waarvan 24 nieuwe provinciewaarnemingen waren: Khuzestan (11), Ilam (4), Esfahan (3), Yazd (2), Lorestan, Bushehr, Khorasan-e Razavi and Kohgiluyeh-va Boyerahmad (elk 1). Ondanks de beschikbare informatie over dagvlinders in Iran, is verder onderzoek naar de soortendiversiteit in alle gebieden nodig om de lokale verspreidingskaarten en taxonomische indeling van dagvlinders in Iran te evalueren

Résumé. Des papillons diurnes, avec environ 19 000, espèces, sont l'un des groupes d'insectes les plus connus et appartiennent à cinq familles en Iran. Dans cet article, nous discutons de l'étude des papillons de la "Collection d'insectes et d'acariens d'Ahvaz". Située dans le département de la protection des plantes de l'université Shahid Chamran d'Ahvaz, cette collection de 55 ans contient des spécimens provenant de 21 provinces iraniennes. Toutes les papillons dans la collection ont été étudiées et identifiées. À cette fin, les motifs des ailes et des organes génitaux ont été étudiés et, dans certains cas, nous avons utilisé codage à barres de l'ADN utilisant les amorces standards (LepF1 & LepR1). Au total, 82 espèces et sous-espèces ont été identifiées: Papilionidae (5 taxons), Hesperiidae (11 taxons), Lycaenidae (15 taxons), Pieridae (17 taxons) et Nymphalidae (34 taxons), dont 24 nouvelles observations provinciales: Khuzestan (11), Ilam (4), Ispahan (3), Yazd (2), Lorestan, Bushehr, Khorasan-e Razavi et Kohgiluyeh-va Boyerahmad (1 chacun). En dépit des informations connues sur les papillons en Iran, des recherches supplémentaires sur la diversité des espèces dans toutes les régions sont nécessaires pour évaluer les cartes de distribution locale et la disposition taxonomique des papillons en Iran.

Key words: Lepidoptera – insect collection – taxonomy – sugarcane – Khuzestan.

Zerganipour A.: Department of Plant Protection, Faculty of Agriculture, Shahid Chamran University of Ahvaz, Ahvaz, Iran. ahlamzergani73@gmail.com

Esfandiari M.: Department of Plant Protection, Faculty of Agriculture, Shahid Chamran University of Ahvaz, Ahvaz, Iran. Corresponding author. esfandiari@scu.ac.ir

Naderi A.: Natural History Museum and Genetic Resources, Department of Environment, Tehran, Iran. a2naderi@yahoo.com

Rabieh M.M.: Department of Plant Protection, Faculty of Agriculture, University of Birjand, Birland, Iran. mmrabie@birjand.ac.ir

Introduction

With close to 19,000 described species, the butterflies presumably represent the largest invertebrate clade for which the species inventory is almost complete (Kristensen *et al.* 2007, van Nieukerken *et al.* 2011). The first reliable document concerning the Lepidoptera of Iran was published by the French zoologist, Édouard Ménétriès (1832) who recorded butterflies of the northwestern borders of Iran. Since then, other explorers made expeditions to different parts of Iran and published many papers on Iranian Lepidoptera describing many new taxa. Some of these which were published in the Journal of Entomological Society of Iran during 1973–1975, are among the most important published documents on the Iranian Rhopalocera. During 1980–1994 the study of Iranian Lepidoptera went through a period of recession. Nevertheless, since the mid-90 intensive research activity has been started again by European lepidopterists.

The Butterflies of Iran (Nazari 2003) was the first synthesis on Iranian butterflies and listed 379 taxa of Iranian butterflies known at that time including data on their distribution, descriptions, flight behavior, host plants as well as their photos in Persian. Before that, there was no reference book on Iranian butterflies and related information was scattered in papers and notes of mostly amateur lepidopterists.

Fig. 1. Provinces of Iran / Iraanse provincies: 1. Azarbaijan-e Gharbi (AZG) 2. Azarbaijan-e Sharghi (AZS) 3, Ardabil (ARD) 4. Kordestan (KRD) 5. Zanjan (ZNJ) 6. Gilan (GIL) 7. Kermanshah (KRS) 8. Hamedan (HMD) 9. Qazvin (QZV) 10. Mazandaran (MAZ) 11. Alborz (ALB) 12. Markazi (MRK) 13. Lorestan (LOR) 14. Ilam (ILM) 15. Golestan (GLS) 16. Khorasan-e Shomali (KHS) 17. Khorasan-e Razavi (KHR) 18. Semnan (SMN) 19. Qom (QOM) 20. Esfahan (ESF) 21. Chaharmahal-va-Bakhtiari (CHB) 22. Khuzestan (KHZ) 23. Kohgiluyeh-va-Boyerahmad (KGB) 24. Khorasan-e Jonubi (KHJ) 25. Yazd (YZD) 26. Sistan-va-Baluchestan (SIB) 27. Kerman (KRM) 28. Fars (FRS) 29. Bushehr (BUS) 30. Hormozgan (HRM) 31. Tehran (THR).

Naderi (2012) tried to present the most important and interesting data on Iranian butterflies for nearly 200 taxa including endemic ones, most frequent or rare taxa. The field guide of butterflies of Iran was accomplished with perfect photographs which captured the behaviour of the species in nature. Furthermore, Naderi (2012) listed 406 taxa of Iranian butterflies in this book. Thereafter, Tshikolovets *et al.* (2014) covered the 412 taxa currently known in Iran. Specimens of almost all species were shown on the plates including many type specimens, historical and very rare specimens.

Because of its diverse climate, geological formations and soils, Iran is home to outstanding biodiversity. Nevertheless, increased population and human activity, climate change, drought, desertification, agriculture, poaching and economic sanctions have created a biodiversity crisis (Jowkar *et al.* 2016). Hence, monitoring of threats is necessary for the conservation of such fragile biodiversity. Butterflies are useful habitat indicators in temperate and tropical regions and changes in their diversity are likely to indicate changes in a broad variety of invertebrates (Scoble 1992). Despite such important role of butterflies in nature and their interesting diversity in Iran, there is no expert of butterflies in Iranian universities so that research on Rhopalocera is rare among publications from universities. Therefore, we aimed to study the butterflies of the Insect and Mite Collection of Ahvaz (IMCA) located at the Shahid Chamran University of Ahvaz. This collection dates back to about 55 years ago.

Material and Methods

Butterfly specimens have been collected by many students of the Department of Plant Protection from different Provinces in Iran (fig. 1) during the last 5 decades and were deposited in the IMCA located at the Shahid Chamran University of Ahvaz, Khuzestan Province, Iran. Identifications of this material were made according to Nazari (2003), Naderi (2012) and Tshikolovets *et al.* (2014). Final confirmation was done by the third author. Daily sampling was carried out with a collecting net during 2017–2018 in some parts of Khuzestan. Since longitude and latitude was not provided for the majority of the specimens by the student collectors, the data of the examined material do not contain such information. We have not included the name of the collectors in the examined material. As there is no agreement on the taxonomical status of some described subspecies, we therefore did not include them in the list of the butterflies of Khuzestan. For example, the subspecies *Argynnis niobe*

khusestana Gross & Ebert, 1975, *Argynnis pandora deserticola* Gross & Ebert, 1975 and *Limenitis reducta mirzayani* Gross & Ebert, 1975 were previously reported from Khuzestan (Modarres Awal 2002) but are considered as synonym taxa according to some authors like Tshikolovets *et al.* (2014). Eight species (15 specimens) which were collected by students from Iranian provinces were found in the collection without detailed data labels.

Systematics and nomenclature are according to the checklist of Wiemers *et al.* (2018), and for those which were not in this checklist we followed Tshikolovets *et al.* (2014).

Results

In total, 82 taxa belonging to Papilionidae (5), Hesperiidae (11), Lycaenidae (15), Pieridae (17) and Nymphalidae (34) were identified from 21 different Iranian provinces, among the butterflies in the IMCA collection. The total results include 24 new provincial records as follows: Khuzestan (11), Ilam (4), Esfahan (3), Yazd (2), Lorestan, Bushehr, Khorasan-e Razavi and Kohgiluyeh-va Boyerahmad (1 each).

New records for Khuzestan fauna according to the current study are Hesperiidae: *Gegenes nostrodamus* (Fabricius, 1793) and *Carcharodus stauderi* Reverdin, 1913; Lycaenidae: *Zizeeria karsandra* (Moore, 1865) and *Lachides galba* (Lederer, 1855); Pieridae: *Pieris krueperi* Staudinger, 1860 and *Pieris persis* (Verity, 1908); Nymphalidae: *Hypolimnas misippus* (Linnaeus, 1764), *Melitaea gina* Higgins, 1941, *Kirinia climene* (Esper, 1783), *Melanargia larissa lorestanensis* Carbonell & Naderi, 2007 and *Hyponephele wagneri* (Herrich & Schäffer, [1846]).

All the studied material is presented here together with notes on the provincial distribution of the species in Iran, their bionomics and identification.

Superfamily Papilionoidea Latreille, [1802]
Family Papilionidae Latreille, [1802]

***Iphiclides podalirius* (Linnaeus, 1758).** Semnan Province: Shahrud, 1♂ 1♀ 19.vii.1966, 1♀ 1.ix.1966; Tehran Province: Tehran, 1♀ 2.vii.1986; Chaharmahal-va Bakhtiari Province: Shahrekord, 1♂ 5.iv.2013; Lorestan Province: Borujerd, 2♀ 17.vi.1388; Mazandaran Province: Ramsar, 1♀ 15. vii.1995; Qazvin Province: Qazvin, 1♀ 11.x.2011.

Note. It damages citrus trees in southern Iran (Farahbakhsh 1961).

***Papilio machaon* Linnaeus, 1758.** Khuzestan Province: Ahvaz, 1♂ 28.xi.2005, 1♂ 26.v.2006, 1♂ 11.iv.2014; Dezful, 1♂ 29.xii.2005; Baghmalek, 1♀ 4.vi.2016, 1♂ 15.iii.2017, 3♀ 1♂ 17.iii.2017; Shushtar, 1♀ 9.iv.2005; Esfahan Province: Khomeyni Shahr, 1♂ 22.iii.2010.

***Papilio demoleus* Linnaeus, 1764.** Khuzestan Province: Ahvaz, 1♂ 24.iii.1973, 1♂ 17.xii.1974, 1♀ 1.xii.1974, 1♂ 17.xii.1974, 1♂ 30.iii.1983, 1♂ 8.iv.1984, 1♀ 2.v.1984, 1♂ 10.v.1984, 1♀ 29.v.1984, 1♀ 27.vi.1984, 1♀ 20.iv.1985, 2♂ 22.v.1985, 1♂ 26.v.1985, 1♂ 14.vi.1985, 1♂ 17.vi.1985, 3♂ 26.x.1985, 1♂ 1♀ 31.x.1989, 1♂ 4.xi.1985, 1♀ 14.xi.1985, 1♂ 23.xi.1985, 1♂ 24.xi.1985, 1♂ 1♀ 28.xi.1985, 1♀ 20.iii.1987, 1♂ 25.iv.1988, 1♂ 29.vii.1989, 1♂ 21.x.1989, 2♂ 25.x.1989, 1♀ 17.x.1990, 1♂ 11.xi.1990, 1♂ 25.iv.1991, 1♂ 10.v.1995, 2♂ 17.xii.1995, 1♀ 29.xi.2002, 1♀ 6.v.2003, 1♂ 24.iv.2004, 1♀ 1.i.2005, 1♂ 27.ii.2006, 1♂ 18.iv.2007, 1♂ 10.v.2007, 2♀ 2.vi.2007, 1♀ 6.vi.2007, 1♀ 24.iii.2008, 1♂ 23.iv.2008, 1♂ 3.xi.2009, 1♀ 23.iv.2010, 1♀ 25.iv.2010, 1♀ 10.v.2010, 1♂ 22.v.2010, 1♀ 23.v.2010, 1♀ 2.vi.2010, 1♂ 4.vi.2010, 1♀ 27.xi.2010, 1♂ 17.ix.2012, 1♂ 26.x.2013, 2♂ 3.xii.2013, 1♂ 14.iv.2016, 1♀ 23.iv.2016, 1♀ 26.iv.2016, 1♂ 23.iii.2017; Haft Tappeh, 1♂ 25.v.1991; Mollasani, 1♂ 22.iii.1968, 1♂ 14.v.2008, 1♀ 20.iv.2011; Dezful, 1♀ 25.viii.1993, 1♀ 10.ii.2003, 1♂ 22.iv.2004, 1♂ 7.v.2007, 1♀ 23.iii.2009, 1♂ 21.ix.2009; Baghmalek, 1♀ 10.xi.2015, 1♂ 14.iii.2016, 1♂ 4.vi.2016, 2♀ 1♂ 17.iii.2017; Lali, 1♂ 17.iii.2016, 2♀ 1♂ 14.iv.2017; Gotvand, 1♂ 28.xi.1985, 1♀ 21.xi.1990; Shush, 1♂ 5.iv.2017, 2♂ 6.iv.2017, 2♂ 7.iv.2017; Shushtar, 1♂ 17.ix.2004, 1♀ 30.xii.2005; Andimeshk, 1♂ 26.xii.2002, Ramhormoz, 1♀ 2.v.2001; Fars Province: Shiraz, 4♀ 23.iii.2001, 1♀ 15.iv.2001, 1♀ 26.iii.2001, 1♀ 1.iv.2001, 1♂ 26.v.2002, 2♂ 26.xi.2004, 3♀ 1♂ 25.3.2005, 1♂ 16.vi.2007, 1♀ 4.vii.2009, 1♀ 4.x.2009, 1♀ 28.vii.2012, 1♀ 29.vii.2012, 1♂ 30.viii.2012, 1♂ 5.ix.2012, 1♂ 10.ix.2012, 1♀ 15.ix.2012; Fasa, 1♂ 25.viii.2005; Marvdasht, 1♀ 30.viii.2012; Esfahan Province: Esfahan, 1♀ 25.vii.2009, 1♀ 3.viii.2009, 1♀ 13.viii.2009, 1♂ 8.v.2010, 1♀ 21.vii.2013; Bushehr Province: Borazjan, 1♂ 28.iii.2006; Kerman Province: Sirjan, 1♂ 24.iii.2007, 1♀ 11.xii.2012; Hormozgan Province: Bandar Abbas, 1♂ 25.iii.2010; Tehran Province: Tehran, 1♂ 1.xii.1990; Yazd Province, 1♂ 24.iii.2012.

***Archon apollinaris* (Staudinger, 1892).** Tehran Province: Tehran, 1♂ 15.viii.2012; Lorestan Province: Khorramabad, 1♀ 25.iii.2015; Kermanshah Province: Kermanshah, 1♀ 24.iii.2015.

Note. Some larvae were intentionally introduced years ago to Tehran and at present a small population can be found there.

***Zerynthia deyrollei* (Oberthür, 1869).** Hamedan Province: Hamedan, 1♀ 21.v.2000.

Family Hesperiidae Latreille, 1809

***Pelopidas thrax* (Hübner, [1821])** (fig. 2). Khuzestan Province: Ahvaz, 1♀ 30.x.1984, 1♀ 11.x.1985, 1♀ 23.x.1985, 1♀ 26.x.1985, 2♂ 14.xi.1985, 1♂ 3.v.1995, 1♂ 25.v.1995, 1♂ 1♀ 25.iii.2001, 1♀ 8.iv.2001, 1♂ 9.iv.2001, 1♀ 19.iv.2001, 1♂ 25.ii.2001. 1♂ 23.x.2002, 1♀ 9.xi.2013, 1♀ 12.xi.2002, 1♀ 3.xii.2002, 1♂ 25.iv.2003, 2♀ 26.iv.2003, 1♂ 8.v.2003, 2♂ 17.v.2003, 1♀ 9.xi.2003, 1♂ 2.iii.2004, 1♀ 23.iii.2004, 1♀ 14.x.2004, 1♂ 17.v.2004, 2♂ 1♀ 28.xi.2005, 2♂ 1♀ 9.iv.2007, 1♂ 18.iv.2007, 1♀ 25.iv.2007, 1♂ 27.iv.2007, 1♂ 22.v.2009, 1♂ 10.x.2009, 1♀ 13.x.2009, 1♂ 15.xi.2009, 2♂ 30.v.2010, 1♂ 8.iv.2009, 1♀ 11.iv.2010, 1♂ 23.iv.2010, 2♂ 1♀ 5.v.2010, 1♂ 6.v.2010, 1♂ 6.xii.2010, 1♀ 22.ix.2012, 1♀ 14.x.2012, 1♀ 28.x.2012, 1♂ 21.iii.2013, 1♀ 28.iii.2013, 1♀ 5.v.2013, 1♂

17.v.2013, 2♀ 26.x.2013, 1♀ 11.xi.2013, 1♂ 18.xi.2013, 2♀ 1♂ 20.xi.2013, 1♀ 21.xi.2013, 1♀ 22.xi.2013, 2♂ 25.xi.2013, 1♂ 29.xi.2013, 1♂ 3.xii.2013, 3♂ 7.xii.2013, 1♀ 3.x.2014, 1♀ 15.ii.2016, 1♀ 27.iii.2016, 1♀ 17.v.2017; 40 Kms. SW Ahvaz, Amir-Kabir Sugarcane Co., 25♀ 55♂ 8.ix.2015; Debal-Khozaii Sugarcane Co., 52♀ 46♂ 8.ix.2015; Dezful, 1♂ 2.xi.1985, 1♂ 26.ix.2011, 1♂ 16.vi.2012; Shushtar, 1♂ 19.x.2005, 1♀ 25.x.2005, 2♀ 22.iv.2007; Baghmalek, 1♀ 10.xi.2015, 1♀ 20.xi.2015, Khorramshahr, 1♀ 1♂ 7.x.2012; Haft Taapeh, 1♀ 1.viii.2011, 1♀ 15.viii.2012, 1♀ 12.x.2013; Mollasani, 1♂ 27.iv.1991, 1♂ 14.v.2003; Shush, 1♂ 31.iii.2017; a lot of males and females from Ahvaz, Mollasani and Lali collected during 2017–2018; Fars Province: Shiraz, 1♀ 23.iii.2005, 2♀ 23.iii.2007, 1♂ 17.iv.2007, 1♂ 27.iv.2007; Lorestan Province: Khorramabad, 1♀ 6.ix.2015; Aligudarz, 1♂ 6.xii.2011; Hormozgan Province: Bandar Abbas, 1♀ 23.ix.2009.

Note. Specimens of this species were collected from sugarcane fields in the Khuzestan Province. It was previously identified and reported as *Parnara* sp. in the sugarcane fields (Taherkhani 2016). Green larvae of this species feed on sugarcane leaves and roll these using white silk. Additional material was also studied from neighbouring areas in Khuzestan such as Ahvaz, Khorramshahr, Mollasani, Shushtar, Dezful, Shush and Lali. We examined wing patterns, genitalia, and also performed DNA barcoding using standard primers (LepF1 & LepR1) for the identification of this species. Results revealed that it is actually *Pelopidas thrax*, despite its similar habitus to members of the genus *Parnara*. Outside Iran, it is known as the millet skipper and occurs from the eastern Mediterranean islands to North Africa, the Middle East, India and Pakistan. It feeds on *Saccharum kajkaiense* in Oman (Cock 2009). It has at least two generations in Khuzestan and is frequently seen on shrub verbenas and reed species. This taxon is new to the Lorestan Province.

***Eogenes alcides* (Herrich-Schäffer, [1852]).** Ilam Province: Eyvan, 1♂ 1.ix.2013.

Note. This species is new to the Ilam Province.

***Gegenes nostrodamus* (Fabricius, 1793)** (fig. 2). Khuzestan Province: Ahvaz, 1♀ 12.v.2011, 1♂ 25.iv.2014, 1♂ 23.iv.2017; Shushtar, 1♀ 1.ix.2005; Dezful, 1♂ 11.viii.1995; Ilam Province: Eyvan, 1♂ 1♀ 1.ix.2013.

Note. This taxon is new to the Khuzestan and Ilam Provinces.

***Ochlodes hyrcana* (Christoph, 1893).** 1♂ no data label.

***Thymelicus sylvestris* (Poda, 1761).** Lorestan Province: Aligudarz, 1♀ 2.xi.2013.

***Thymelicus lineola* (Ochsenheimer, 1808).** Fars Province: Shiraz, 1♂ 15.v.2005.

***Spialia orbifer* (Hübner, [1823]).** Khuzestan Province: Ahvaz, 1♀ 22.iv.2015; Esfahan Province: Semirom, 1♂ 3.vii.2013.

***Carcharodus alceae* (Esper, [1780]).** Fars Province: Shiraz, 1♀ 9.viii.2003, 1♀ 30.vii.2009, 1♀ 9.viii.2009; Kerman Province: Sirjan, 1♂ 6.ix.2012, 1♂ 21.x.2012; Lorestan Provice: Khorramabad, 1♀ 6.ix.2015, 1♂ 7.ix.2015; Khuzestan Province: Baghmalek, 1♂ 11.x.2015, 1♀ 1.vii.2017; Chaharmahal-va Bakhtiari Province: Borujen, 1♂ 3.v.2012.

***Carcharodus stauderi* Reverdin, 1913.** Khuzestan Province: Ahvaz, 1♂ 30.xi.2013; Esfahan Province: Esfahan, 1♀ 19.vii.2009.

Note. This taxon is new to the Khuzestan Province.

***Erynnis marloyi* (Boisduval, 1834).** Fars Province: Shiraz, 1♂ 6.v.2001.

***Pyrgus armoricanus* (Oberthür, 1910).** Lorestan Province: Khorramabad, 1♂ 5.ix.2015.

Family Pieridae Swainson, 1820

***Genopteryx rhamni* (Linnaeus, 1758).** Kermanshah Province: Kermanshah, 1♀ 15.viii.1994; Fars Province: Shiraz, 1♂ 15.viii.2003; Golestan Province: Azadshahr, 1♂ 25.iv.1997.

***Colias croceus* (Geoffroy, 1785).** Khuzestan Province: Ahvaz, 1♂ 24.x.1994, 1♀ 20.i.1995, 1♂ 16.iv.1995, 1♂ 20.iv.1995, 1♀ 30.iv.1995, 1♂ 12.v.1995, 2♂ 17.v.1995, 1♂ 25.v.1995, 1♀ 27.iii.1998, 1♂ 8.iii.2001, 1♂ 9.iv.2001, 1♀ 10.v.2001, 1♂ 7.v.2002, 1♀ 6.iii.2003, 1♂ 7.iii.2003, 1♂ 6.v.2004, 2♀ 1♂ 3.viii.2005, 1♂ 27.ix.2006, 2♂ 2.iv.2008, 1♂ 29.iv.2008, 2♂ 4.v.2008, 2♂ 25.v.2008, 1♂ 30.v.2008, 1♂ 22.iv.2009, 1♂ 25.iv.2009, 1♂ 29.iv.2009, 1♂ 30.i.2010, 2♂ 24.ii.2010, 1♀ 1.v.2011, 1♂ 8.iv.2012, 1♂ 9.iv.2013, 1♂ 12.iv.2013, 1♂ 2.ii.2015, 1♀ 6.iv.2015, 1♂ 1♀ 25.iv.2015, 1♂ 15.iii.2017; Haft Tappeh, 1♂ 29.iv.1991; Ramhormoz, 1♀ 30.iv.2001, 1♂ 24.iii.2013; Andimeshk, 1♀ 25.x.2005, 1♀ 1♂ 26.iv.2012; Dezful, 1♂ 15.v.1995, 1♀ 4.v.2008, 1♀ 13.iii.2006, 1♂ 15.iii.2013; Baghmalek, 1♀ 4.v.2016, 1♀ 18.iii.2017; Mollasani, 1♂ 3.iv.1967, 1♂ 10.v.1967, 1♂ 16.xi.1967, 1♂ 11.v.1968; Behbahan, 1♂ 13.vi.1985; Kerman Province: Jiroft, 1♂ 24.iii.2012, 1♀ 23.vii.2012, 1♀ 27.vii.2012, 1♂ 2.viii.2012, 1♂ 20.ix.2012; Sirjan, 2♀ 3.iv.2008; Lorestan Province: Khorramabad, 1♂ 6.vii.2011, 1♂ 1♀ 15.v.2015; Borujerd, 1♂ 22.iii.2004, 1♂ 6.v.2004, 1♀ 14.viii.2004, 2♂ 23.viii.2004; Aligudarz, 1♂ 22.iii.1966, 1♂ 15.v.2011; Fars Province: Shiraz, 1♀ 13.v.2002, 1♀ 9.viii.2009, 1♂ 14.vii.2011; Marvdasht, 1♂ 31.vii.2012; Chaharmahal-va Bakhtiari Province: Shahrekord, 1♂ 26.iii.2013, 1♂ 26.vi.2014, 1♂ 11.vii.2014; Borujen, 1♂ 15.viii.2012, 1♀ 7.ix.2012; Bushehr Province: Bushehr, 1♀ 22.iii.2014; Esfahan Province: Esfahan, 1♂ 8.v.2009, 1♀ 1.ix.2009, 1♂ 2.ix.2010, 1♀ 6.vii.2011; Hamedan Province: Hamedan, 1♀ 30.viii.2012; Kohgiluyeh-va Boyerahmad Province: Yasuj, 1♂ 22.viii.2012; Kermanshah Province: Kermanshah, 1♂ 15.viii.1994, 1♂ 19.viii.1994; Ilam Province: Eyvan, 2♂ 1♀ 22.v.1998; Yazd Province: Yazd, 1♂ 30.iv.2012, 4♂ 2♀ 15.ix.2012; Mazandaran Province: Ramsar, 1♂ 15.i.1995; Khorasan-e Razavi Province: Mashhad, 1♂ 4.iv.2001.

Colotis fausta **(Olivier, [1804])** (fig. 2). Khuzestan Province: Ahvaz, 1♂ 27.vii.1964, 1♀ 26.xi.1964, 1♀ 2.xii.1964, 1♀ 26.x.1985, 1♀ 29.ix.1985, 1♂ 17.x.1985, 1♂ 12.xi.1985, 1♂ 29.x.1985, 1♂ 25.xi.1985, 1♂ 27.xi.1985, 1♀ 7.i.1986, 1♀ 24.viii.2009, 1♂ 24.x.1989, 1♂ 29.vi.1991, 1♀ 25.x.1990, 1♀ 4.xii.1990, 1♂ 29.v.1991, 3♂ 26.vi.1991, 1♀ 23.v.1992, 1♂ 11.iv.1995, 1♂ 21.v.1995, 1♀ 12.x.1999, 1♂ 12.x.2002, 1♂ 14.v.2004, 1♂ 5.xi.2002, 1♀ 1♂ 13.x.2002, 1♂ 30.xi.2002, 1♂ 14.i.2003, 1♀ 30.i.2003, 1♀ 8.v.2003, 2♀ 7.xi.2003, 1♀ 8.v.2003, 2♀ 7.xi.2003, 1♀ 21.iv.2004, 1♂ 24.iv.2004, 1♀ 3.v.2004, 5♀ 8.v.2004, 1♂ 9.v.2004, 1♂ 14.v.2004, 1♂ 25.iv.2005, 5♀ 2♂ 7.xi.2005, 1♀ 10.v.2006, 2♀ 22.iv.2008, 1♂ 29.iv.2008, 1♀ 11.x.2008, 1♂ 10.ix.2009, 1♀ 10.x.2009, 1♀ 1♂ 23.ii.2010, 1♀ 1.iv.2010, 2♀ 5.v.2010, 1♂ 21.ii.2011, 1♂ 1♀ 1.v.2012, 1♂ 2.ix.2012, 3♂ 3♀ 26.ix.2012, 3♂ 22.xi.2013, 1♀ 30.xi.2013, 1♀ 7.ix.2015; Gotvand, 1♀ 26.xi.1990; Dezful, 1♀ 3.xi.1994; Baghmalek, 1♀ 10.xi.2015, 1♀ 1♂ 20.xi.2015; Haft Tappeh, 2♂ 3.v.2012, 1♂ 2.viii.2012, 1♂ 15.viii.2012; Mollasani, 1♀ 25.ii.1944, 1♀ 28.x.1964, 1♂ 11.xi.1964, 1♀ 18.xi.1964, 1♂ 10.iv.1965, 1♀ 11.iv.1965, 1♂ 29.iv.1965, 1♂ 24.i.1968, 1♂ 15.iv.1985, 1♀ 10.v.1968, 1♂ 20.iv.2011; Fars Province: Shiraz, 1♀ 7.xi.2005; Nurabad, 1♂ 15.viii.2012; Kohgiluyeh-va Boyerahmad Province: Yasuj, 1♀ 25.viii.2012; Esfahan Province: Esfahan, 1♂ 5.v.2010; Ilam Province: Eyvan, 3♂ 2♀ 1.ix.2013; Kermanshah Province: Sarpol-e Zahab, 1♀ 19.vii.1990; Lorestan Province: Aligudarz, 1♂ 24.iii.1966.

Note. This taxon is new to the Kohgiluyeh-va Boyerahmad Province.

Anaphaeis aurota **(Fabricius, 1793).** Khuzestan Province: Ahvaz, 1♀ 2.xii.1964, 1♂ 30.x.1987, 1♀ 25.ii.1995, 1♀ 1♂ 30.ix.2002, 1♀ 16.xii.2002, 1♀ 17.v.2003, 1♀ 28.x.2003, 2♀ 20.iv.2004, 1♀ 25.iv.2004, 1♀ 3.v.2004, 1♂ 5.v.2004, 3♂ 2♀ 6.v.2004, 1♂ 9.v.2004, 1♀ 22.v.2004, 1♀ 7.iii.2008, 2♀ 22.iv.2008, 1♀ 29.iv.2008, 1♀ 2.v.2008, 1♂ 5.v.2008, 1♀ 6.v.2008, 1♂ 9.v.2008, 1♀ 26.v.2008, 1♀ 5.v.2013, 1♂ 19.x.2013, 2♀ 26.x.2013, 1♀ 28.x.2013, 1♀ 16.xi.2013, 1♀ 18.xi.2013, 1♀ 19.xi.2013, 3♂ 2♀ 22.xi.2013, 2♂ 25.xi.2013, 1♂ 26.v.2013, 3♀ 27.xi.2013, 3♂ 1♀ 30.xi.2013, 3♂ 3♀ 7.xii.2013, 1♂ 30.xi.2014, 1♂ 23.iv.2016, 1♂ 15.vi.2016; Dezful, 1♂ 6.xi.2011, 1♀ 8.xi.2011; Susangerd, 1♂ 7.x.2015; Mollasani, 1♂ 5.iv.1965, 1♂ 24.iv.1965, 1♂ 16.iii.1966, 1♂ 11.xi.2002, 1♀ 25.ii.1999; Baghmalek, 2♂ 5.x.2015, 1♂ 11.x.2015, 1♂ 4.xi.2015, 4♂ 1♀ 10.xi.2015; Ramhormoz, 1♂ 9.iv.1998, 1♂ 29.iv.2002; Fars Province: Marvdasht, 1♂ 25.vii.2012, 1♂ 31.vii.2012; Shiraz, 1♀ 9.v.2003, 1♂ 9.ix.2005, 1♂ 9.ix.2009; Esfahan Province: Esfahan, 1♀ 23.vii.2009; Lorestan Province: Aligudarz, 1♂ 10.v.2011.

Aporia crataegi **(Linnaeus, 1758).** Khuzestan Province: Ahvaz, 1♀ 25.iv.2010, 1♂ 22.v.2010, 1♀ 6.iv.2015, 1♀ 25.iv.2015; Fars Province: Shiraz, 1♀ 21.iv.2002, 1♀ 21.iv.2006; Kerman Province: Sirjan, 1♂ 25.iii.2007; Yazd Province: Yazd, 1♂ 24.iii.2012; Esfahan Province: Esfahan, 1♂ 21.vii.2013.

Note. This taxon is new to the Esfahan Province.

Pontia chloridice **(Hübner, [1813]).** Lorestan Province: Aligudarz, 1♂ 22.iii.1966, 1♂ 25.iii.1966.

Pontia callidice **(Hübner, [1800]).** Esfahan Province: Esfahan, 1♂ 12.viii.2013.

Pontia daplidice **(Linnaeus, 1758).** Khuzestan Province: Ahvaz, 1♀ 9.v.1965, 1♂ 28.ii.1995, 1♀ 27.iii.1997, 1♀ 10.v.2001, 1♀ 25.iv.2007, 1♂ 9.v.2008, 1♀ 31.x.2013; Mollasani, 1♂ 31.vii.1964, 1♂ 1.xi.1964, 1♀ 23.iii.1968, 1♀ 1.v.1968; Dezful, 1♂ 11.v.1991; Izeh, 1♀ 26.x.2015; Lorestan Province: Aligudarz, 1♂ 7.ix.2011, 1♂ 23.vii.2013; Azna, 1♂ 22.vii.2000; Khorramabad, 1♀ 15.v.2015, 1♂ 5.ix.2015, 1♀ 6.ix.2015; Chaharmahal-va Bakhtiari Province: Borujen, 1♀ 12.viii.2012, 1♀ 16.viii.2012, 1♂ 7.xi.2012; Kerman Province: Sirjan, 1♂ 24.iii.2007, 2♂ 27.iv.2007.

Pieris krueperi **Staudinger, 1860** (fig. 2). Khuzestan Province: Ahvaz, 1♀ 22.iii.2007.

Note. This taxon is new to the Khuzestan Province.

Pieris brassicae **(Linnaeus, 1758).** Esfahan Province: Esfahan, 1♀ 6.viii.2009.

Note. This taxon is new to the Esfahan Province. It is a pest on Brassicaceae in northern Iran (Khanjani 2005).

Pieris rapae **(Linnaeus, 1758).** Khuzestan Province: Dezful, more than 120 specimens which were collected from 1946 to 2017; Mollasani, 1♀ 1♂ 15.ii.1964, 1♂ 3.iii.1964, 1♂ 5.iii.1964, 1♂ 7.ii.1965, 1♀ 24.iii.1965, 1♀ 5.iv.1965, 1♂ 12.iv.1965, 1♀ 9.iv.1966, 1♂ 30.iv.1966, 1♂ 7.iv.1968, 1♂ 10.v.1968, 1♂ 20.iv.1966, 1♂ 23.iv.1968, 1♂ 4.v.1968, 1♀ 20.xii.1968, 1♀ 20.ii.1995, 1♀ 24.x.2001, 1♀ 6.x.2002, 1♀ 20.iv.2011; Haft Tappeh, 1♀ 4.ix.2011, 8♀ 3.v.2012, 1♀ 18.ix.2012; Bostan, 1♀ 20.iii.2017, 1♀ 21.iii.2017, 1♀ 22.iii.2017, 1♀ 23.iii.2017; Andimeshk, 1♀ 25.iii.2016, 5♀ 1♂ 1.iv.2016, Shush, 1♀ 23.iii.2017, 1♀ 28.xi.2017, 1♂ 1♀ 6.iv.2017, 3♀ 12.iv.2017, 1♂ 18.iv.2017, 2♀ 9.v.2017; Gotvand, 1♂ 26.xi.1990, Shushtar, 1♂ 21.i.2006, 1♀ 28.iii.2016; Fars Province: Shiraz, 1♀ 5.vi.1987, 1♀ 11.ix.1994, 1♂ 24.iv.2000, 1♂ 5.vi.2005, 1♂ 2.v.2007, 1♀ 2.vii.2011, 1♂ 18.viii.2012; Marvdasht, 1♀ 5.ix.2017; Yazd Province: Yazd, 1♂ 24.iii.2012; Kerman Province: Sirjan, 3♀ 2.iv.2008; Jiroft, 1♀ 9.viii.2012, 1♂ 13.viii.2012; Mazandaran Province: Abbasabad, 2♀ 2.xi.2012, Lorestan Province: Borujerd, 1♀ 14.viii.2005; Khorramabad, 1♂ 2.ii.2015, 1♀ 11.ii.2015, 1♀ 15.v.2015, 4♂ 1♀ 5.ix.2015, 6♀ 6.ix.2015, 3♀ 7.ix.2015; Chaharmahal-va Bakhtiari Province: Shahrekord, 1♀ 31.iii.2013; Borujen, 1♂ 6.viii.2014; Ilam Province: Dehloran, 1♂ 14.iv.2014; Khorasan-e Razavi Province: Mashhad, 1♂ 4.iv.2001, 1♀ 5.v.2000; Kermanshah Province: Kermanshah, 1♀ 19.viii.1994; Esfahan Province: Esfahan, 1♀ 25.vii.2001, 1♀ 1.iv.2009, 1♀ 25.vii.2009, 1♂ 11.vii.2011, 1♀ 14.iv.2013; Tehran Province: Tehran, 1♀ 11.xi.2012.

Note. This species damages Brassicaceae in Iran (Khanjani 2005).

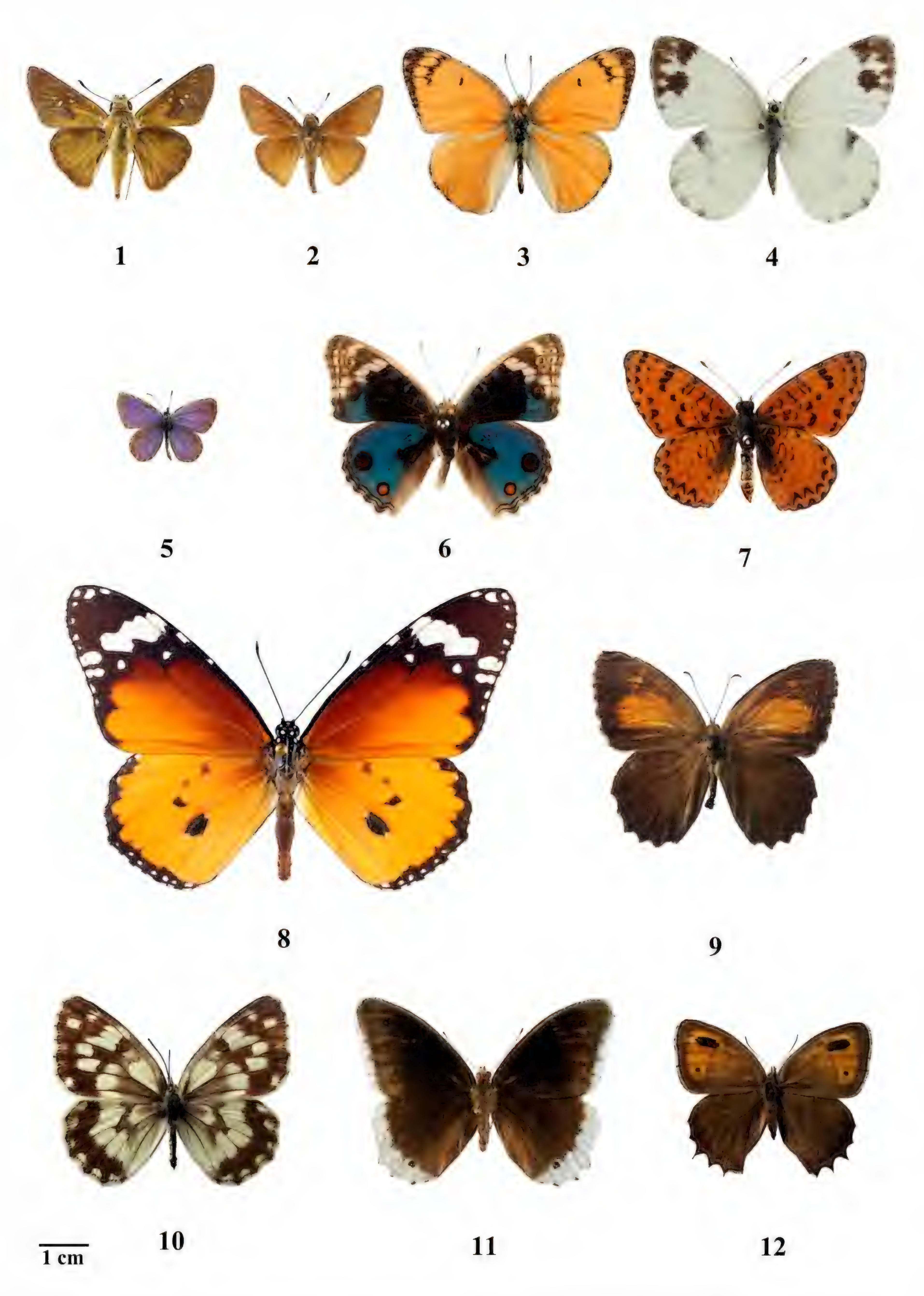

Fig. 2. Voucher specimens of some new provincial records. Photo: © A. Zerganipour / Bewijsexemplaar van enkele nieuwe provinciewaarnemingen Foto: © A. Zerganipour: 1- *Pelopidas thrax* (Khuzestan, Ahvaz, 14.x.2017) 2- *Gegenes nostrodamus* (Khuzestan, Ahvaz, 23.iv.2017) 3- *Colotis fausta* (Khuzestan, Ahvaz, 29.x.2002) 4- *Pieris krueperi* (Khuzestan, Ahvaz, 22.iii.2007) 5- *Zizeeria karsandra* (Khuzestan, Ahvaz, 06.xii.2013) 6- *Junonia orithya* (Khuzestan, Shush, 05.iv.2017) 7- *Melitaea gina* (Lorestan, Aligudarz, 15.v.2011) 8- *Danaus chrysippus* (Khuzestan, Ahvaz, 28.xi.1971) 9- *Kirinia climene* (Hamedan, 05.vi.2000) 10- *Melanargia larissa lorestanensis* (Fars, Shiraz, 8.v.2000) 11- *Hipparchia parisatis* (Yazd, Herat, 24.iii.2012) 12- *Hyponephele wagneri* (Khuzestan, Izeh, 30.viii.2010).

Pieris napi pseudorapae **(Verity, [1908]).** Khuzestan Province: Ahvaz, 1♂ 11.xi.1990, 1♂ 12.iii.1995, 1♂ 2.v.1998, 1♀ 9.v.2001, 1♀ 4.v.2002, 1♂ 9.iii.2003, 1♂ 21.iv.2003, 1♂ 8.iii.2004, 1♂ 20.iv.2004, 1♂ 22.iv.2004, 1♀ 31.vii.2004, 1♂ 2.v.2004, 1♂ 25.iv.2005, 1♀ 7.iv.2007, 1♀ 14.iv.2007, 4♀ 1♂ 8.iv.2008, 1♂ 4.v.2008, 1♂ 25.iv.2009, 1♂ 4.vi.2009, 1♂ 23.iv.2010, 1♂ 10.v.2010, 1♀ 7.ii.2011, 1♀ 14.v.2011, 1♂ 10.iv.2013, 1♀ 26.ix.2012, 1♂ 1.iii.2014, 1♂ 23.iv.2014, 1♀ 6.iv.2015, 1♀ 15.iv.2015, 1♀ 7.ix.2015, 1♂ 1.iv.2016, 1♂ 4.ii.2017, 4♀ 23.iv.2017, 1♀ 24.iv.2017, 1♂ 14.v.2017, 1♀ 5.v.2018; Dezful, 1♂ 24.ii.2006, 1♂ 26.vi.2007, 1♀ 31.iii.2012, 1♀ 1♂ 15.iii.2013, 1♂ 7.viii.2014, 1♀ 12.i.2015; Shush, 1♂ 12.iv.2017, 1♂ 13.iv.2017, 1♂ 1♀ 9.v.2017; Andimeshk, 1♂ 26.iv.2012, 1♂ 31.iii.2016; Mollasani, 1♀ 2.v.1964, 1♂ 23.v.1964, 1♂ 30.iii.1965, 1♂ 4.iv.1967, 1♀ 6.iv.1968, 1♂ 3.vi.1969; Haft Tappeh, 1♀ 4.ix.2011, 1♂ 3.v.2012; Baghmalek, 1♂ 9.xi.2015, Bostan, 1♀ 15.iii.2017, 1♀ 21.iii.2017; Masjed Soleyman, 1♀ 17.viii.2008; Shushtar, 1♂ 4.iv.2005, 1♀ 22.iii.2016; Khorasan-e Razavi Province: Mashhad,1♂ 4.iv.2001; Lorestan Province: Borujerd, 1♂ 4.v.2009; Khorramabad, 1♂ 5.ii.2015, 1♂ 6.ii.2015, 1♂ 7.ii.2015; Chaharmahal-va Bakhtiari Province: Shahrekord, 1♂ 29.iii.2007, 1♀ 11.viii.2014; Fars Province: Shiraz, 1♂ 24.iv.2000, 1♂ 9.iv.2001, 1♂ 4.ix.2008, 1♂ 12.xi.2009, 1♂ 30.viii.2012; Kerman Province: Jiroft, 1♂ 28.vii.2012, 1♂ 2.viii.2012, 1♂ 6.viii.2012; Esfahan Province: Esfahan, 1♀ 3.vii.2009.

Note. It is also a pest on Brassicaceae in Northern Iran (Khanjani 2005).

Pieris persis **(Verity, 1908).** Khuzestan Province: Ahvaz, 1♂ 15.v.2003; Kerman Province: Jiroft, 1♂ 22.viii.2012, 1♂ 28.viii.2012; Lorestan Province: Khorramabad, 1♂ 7.ix.2015.

Note. This species is new to the Khuzestan Province. Perhaps some records of *P. napi pseudorapae* from Khuzestan in literature are actually *P. persis*. However, checking those material is necessary for confirmation.

Euchloe belemia **(Esper, 1800).** Khuzestan Province: Dezful, 1♀ 28.iv.2007, 1♀ 30.iii.2012, 5♀ 1♂ 31.iii.2012. 1♀ 19.iv.2013; Ahvaz, 1♀ 15.xii.1996, 3♀ 1♂ 14.ii.2007, 1♂ 26.ii.2007, 1♀ 14.iv.2010, 1♂ 11.ii.2011, 1♀ 3.ii.2016, 1♀ 26.ii.2015, 1♂ 15.iii.2016, 1♀ 16.iv.2016, 1♀ 1♂ 1.iii.2016, 1♀ 1♂ 30.iii.2016, 1♂ 31.iii.2016, 1♂ 1♀ 3.iv.2016, 1♀ 5.iv.2016, 1♀ 8.iv.2016, 2♀ 12.iv.2016, 1♂ 14.ii.2017, 1♂ 23.ii.2015, 1♂ 23.iii.2016; Mollasani, 1♀ 1.iii.1965, 1♂ 5.iv.1965, 1♀ 1.iv.1966; Shushtar, 1♀ 1.vi.2005; Ilam Province: Eyvan, 1♂ 22.v.1998; Dehloran, 1♂ 22.iii.2014; Kerman Province: Sirjan, 1♂ 25.iii.2007; Kohgiluyeh-va Boyerahmad Province: Yasuj, 1♂ 25.iv.2012.

Euchloe persica **(Verity, 1908).** Khuzestan Province: Mollasani, 1♀ 29.iv.1967.

Euchloe transcaspica **(Staudinger, 1892).** Khuzestan Province: Dezful, 1♀ 10.iii.2013.

Zegris eupheme **(Esper, [1804]).** Khuzestan Province: Masjed Soleyman, 1♂ 23.iii.2014; Dezful, 1♂ 23.iii.2014.

Family Lycaenidae [Leach], [1815]

Lycaena thersamon **(Esper, 1784).** Kurdistan Province: Sanandaj, 1♂ 13.v.1996.

Lycaena phlaeas **(Linnaeus, [1760]).** Kerman Province: Konarestan, 1♀ 15.iii.2013; Esfahan Province: Esfahan, 1♀ 23.vii.2009; Khuzestan Province: Ahvaz, 1♂ 22.iv.1985, 1♀ 28.iv.2016; Andimeshk, 1♀ 25.iii.2015; Dezful, 1♀ 13.iv.2012, 1♀ 5.iii.2013, 1♂ 5.iii.2013, Shushtar, 1♀ 4.v.2008; Baghmalek, 1♀ 24.iii.2016, 1♀ 4.vi.2016, 1♀ 29.iii.2016; Fars Province: Shiraz, 1♀ 12.iv.2007; Lorestan Province: Khorramabad, 1♀ 24.vii.1984, 1♀ 2.viii.1984, 1♀ 16.viii.1984, 4♀ 1♂ 19.v.2015, 1♀ 6.ix.2015, 1♀ 7.ix.2015; Yazd Province: Yazd, 1♀ 30.iv.2011.

Note. This taxon is new to the Yazd Province.

Lampides boeticus **(Linnaeus, 1767).** Khuzestan Province: Ahvaz, 1♂ 3.xi.1990, 1♀ 24.iv.2003, 1♀ 2.v.2003, 1♂ 20.iv.2004, 1♀ 29.iii.2008, 1♀ 30.i.2010, 1♀ 23.v.2010, 1♂ 9.xii.2012, 2♂ 18.xi.2013, 1♂ 22.xi.2017, 1♂ 1♀ 7.xii.2013; Shushtar, 1♀ 3.ix.2013, 1♀ 7.ix.2013; Mollasani, 1♂ 2.xi.1964, 3♀ 8.xii.1964, 1♀ 25.iii.1965, 1♂ 9.xii.1965, 1♀ 10.xi.2002; Dezful, 1♀ 10.xii.2005; Kermanshah Province, 1♀ 24.iii.2015.

Note. It has been recorded as a pest on legumes in Iran (Khanjani 2009).

Celastrina argiolus **(Linnaeus, 1758).** Fars Province: Shiraz, 1♀ 24.iii.2003; Khuzestan Province: Ahvaz, 1♀ 1♂ 2.v.2001, 1♀ 2.iv.2003.

Tarucus balkanicus **(Freyer, 1844).** Khuzestan Province: Bostan, 2♂ 1♀ 16.iii.2017, 1♀ 20.iii.2017, 2♀ 1♂ 23.iii.2017, 2♂ 24.iii.2017, 2♀ 26.iii.2017; Ahvaz, 1♂ 18.iii.1995, 1♀ 17.v.1995, 2♀ 1.vi.1995, 1♀ 30.v.2008, 1♀ 1.ii.2001, 1♂ 4.iv.2001, 1♂ 1♀ 2.v.2001, 1♀ 9.xi.2003, 1♀ 5.iv.2005, 1♂ 1.v.2005, 1♀ 11.iv.2006, 1♀ 4.iv.2007, 1♀ 1♂ 3.iv.2008, 2♀ 10.iv.2008, 2♂ 13.ii.2010, 1♀ 17.iv.2010, 1♂ 14.iii.2011, 1♂ 27.iii.2011, 1♀ 11.iv.2011, 1♀ 15.vi.2011, 1♀ 31.i.2012, 3♀ 1♂ 12.iv.2012, 1♂ 26.ix.2012, 1♂ 12.iv.2013, 1♂ 17.x.2013, 1♀ 26.x.2013, 1♀ 5.xi.2013, 1♀ 1♂ 18.xi.2013, 1♀ 30.xi.2013, 1♂ 7.xii.2013, 4♀ 1♂ 5.iv.2014, 1♀ 12.iv.2014, 1♂ 5.iii.2015, 1♀ 18.iv.2015, 1♂ 7.ix.2015, 1♀ 1.iii.2016, 1♂ 8.iv.2016, 1♀ 17.iv.2017, 1♂ 24.iv.2017, 1♀ 6.v.2017, 1♀ 13.v.2017, 2♀ 21.x.2017; Shushtar, 2♀ 23.v.2005, 1♀ 9.iii.2016; Dezful, 1♂ 21.xi.2011, 2♀ 26.iii.2012, 1♀ 9.iv.2012, 1♂ 18.vi.2012; Susangerd, 1♂ 5.iv.2007; Haft Taapeh, 1♂ 21.viii.2012, 1♀ 4.v.2013; Mollasani, 1♀ 18.v.2008; Ramhormoz, 1♂ 7.iii.2013; Izeh, 1♂ 22.x.2013; Ilam Province: Dehloran, 1♀ 27.iv.2014; Eyvan, 2♂ 1.ix.2013; Tehran Province: Tehran, 2♂ 2♀ 15.x.2002, 1♂ 21.iv.2008, 3♂ 2♀ 14.x.2012; Lorestan Province: Borujerd, 1♂ 16.iv.2008; Mazandaran Province: Ramsar, 1♂ 3.i.1995; Kerman Province: Kerman, 1♂ 18.ix.2012.

Tarucus rosaceus **(Austaut, 1885).** Khuzestan Province: Gotvand, 1♀ 28.iv.2011; Ahvaz, 1♀ 8.iv.2001, 1♂ 11.v.2001, 1♂ 10.xi.2002, 1♂ 5.v.2003, 1♀ 11.v.2006, 1♀ 1.xi.2006, 1♂ 1♀ 3.iv.2008, 1♂ 6.v.2008, 1♀

22.iv.2008, 1♂ 28.iii.2013, 1♂ 9.iv.2013, 1♀ 13.vi 1♀ 23.iii.2017, 1♀ 24.iii.2017; Susangerd, 1♀ 5.iv.2007, 1♂ 8.iv.2007; Dezful, 1♀ 26.iii.2012, 1♀ 31.iii.2012; Mollasani, 1♀ 9.v.2003; Haft Tappeh, 1♀ 9.viii.2010, 1♀ 2.iii.2012.

***Zizeeria karsandra* (Moore, 1865)** (fig. 2). Khuzestan Province: Ahvaz, 1♀ 16.xi.1990, 1♂ 4.v.1995, 1♂ 27.iv.2003, 1♂ 1♀ 7.xi.2003, 1♂ 13.ii.2010, 1♂ 27.iv.2012, 4♂ 1♀ 30.xi.2013, 1♀ 1♂ 6.xii.2013, 1♂ 1♀ 7.xii.2013, 1♂ 24.ix.2016, 1♀ 14.iii.2017; Haft Tappeh: 1♂ 2.iv.2012, 1♀ 21.viii.2012; Andimeshk, 1♂ 26.iv.2012; Fars Province: Shiraz, 1♀ 9.ix.2009; Ilam Province: Eyvan, 1♂ 1.ix.2013.

Note. This taxon is new to the Khuzestan and Ilam Provinces.

***Luthrodes galba* (Lederer, 1855).** Khuzestan Province: Ahvaz, 1♂ 26.iv.1995, 1♂ 31.x.2002, 1♂ 26.iv.2012, 1♀ 1.iv.2013, 1♀ 3.vi.2013, 2♀ 17.vi.2014; Haft Tappeh, 1♀ 3.v.2012.

Note. This taxon is new to the Khuzestan Province.

***Luthrodes contracta* (Butler, 1880).** Chaharmahal-va Bakhtiari Province: Lordegan, 1♀ 17.v.2012; Lorestan Province: Borujerd, 1♀ 17.iv.2007.

***Plebejus loewii* (Zeller, 1847).** Khuzestan Province: Dezful, 1♂ 4.v.2012; Ahvaz, 1♂ 4.v.2000.

***Plebejus agestis* ([Denis & Schiffermüller], 1775).** Lorestan Province: Khorramabad, 1♂ 5.ix.2015, 1♀ 6.ix.2015.

***Polymmatus daphnis* ([Denis & Schiffermüller], 1775).** Khuzestan Province: Ahvaz, 1♂ 10.i.2011, 1♂ 14.viii.2011; Lorestan Province: Aligudarz, 1♀ 20.v.2011, 1♀ 17.vi.2011, 1♂ 23.vi.2011, 1♀ 12.viii.2011.

***Polymmatus icarus* (Rottemburg, 1775).** Khuzestan Province: Ahvaz, 1♂ 15.ii.1995, 1♂ 6.iv.2008, 1♂ 26.xi.2010, 1♂ 15.vi.2011, 1♂ 25.iv.2015, 1♂ 15.x.2017; Baghmalek, 1♂ 11.x.2015; Lorestan Province: Khorramabad, 1♂ 26.vii.1984, 3♂ 4.ix.2015, 3♂ 6.ix.2015, 2♂ 7.ix.2015; Aligudarz, 1♂ 17.ix.2013, 1♀ 12.viii.2011, 1♂ 17.ix.2013; Borujerd, 1♂ 9.v.2008, 2♂ 7.v.2004, 1♂ 1.vi.2004, 1♂ 7.vi.2004, 1♂ 7.ix.2008; Yazd Province: Yazd, 10♂ 1♀ 9.viii.2011; Chaharmahal-va Bakhtiari Province: Shahrekord, 1♂ 14.vi.2014, 1♂ 18.vi.2014; Lordegan, 2♂ 18.viii.2015, Boldaji, 1♂ 7.ix.2012; Fars Province: Shiraz, 2♂ 26.vi.2009, 1♂ 28.vi.2009, 1♂ 15.viii.2012; Esfahan Province: Esfahan, 1♂ 12.viii.2009, 1♂ 3.xi.2009; Kerman Province: Jiroft, 1♂ 7.viii.2012; Hamedan Province: Hamedan, 1♂ 30.viii.2012.

***Polyommatus hamadanensis* (de Lesse, 1959).** Chaharmahal-va Bakhtiari Province: Shahrekord, 1♂ 8.vii.2014, 1♂ 20.vii.2014.

***Polymmatus cyaneus* (Staudinger, 1899).** Chaharmahal-va Bakhtiari Province: Shahrekord, 1♂ 8.vii.2014; Esfahan Province: Esfahan, 1♀ 16.ix.2013.

Family Nymphalidae Rafinesque, 1815

***Limenitis reducta* Staudinger, 1901.** 3♀ 1♂ no data label.

***Issoria lathonia* (Linnaeus, 1758).** Golestan Province: Azadshahr, 1♂ 7.ix.1997.

***Argynnis paphia* (Linnaeus, 1758).** 1♂ no data label.

***Argynnis pandora* ([Denis & Schiffermüller], 1775).** Khuzestan Province: Ramhormoz, 1♀ 22.ii.2003; Ahvaz, 1♀ 23.v.1985, 1♂ 1♀ 24.v.1994; Mollasani, 1♀ 9.iv.1968; Alborz Province: Karaj, 4♀ 24.iv.2001; Lorestan Province: Borujerd, 1♀ 31.vii.1984, 1♀ 21.viii.1885; Khorramabad, 1♀ 24.vii.1984, 1♀ 30.vii.1984, 1♀ 24.viii.1984; Aligudarz, 1♀ 16.v.2011; Fars Province: Shiraz, 2♀ 24.iii.2003; Nurabad, 1♀ 19.i.2012; Kordestan Province: Sanandaj, 1♀ 1♂ 13.v.1966; Esfahan Province: Esfahan, 1♀ 8.v.2010; Kermanshah Province: Kermanshah, 2♂ 15.viii.1995; Golestan Province: Gorgan, 1♀ 11.ix.2014; Tehran Province: Lavasan, 1♀ 5.i.1977, 1♀ 26.viii.1966; Hamedan Province: Hamedan, 1♀ 24.v.2000; Chaharmahal-va Bakhtiari Province: Shahrekord, 1♀ 25.v.2010; Lordegan, 1♀ 21.vii.2015, 1♀ 16.viii.2015.

***Argynnis niobe* (Linnaeus, 1758).** Khuzestan Province: Ahvaz, 1♀ 1♂ 25.iv.2015; Golestan Province: Azadshahr, 1♂ 6.viii.1997; Hamedan Province: Hamedan, 1♀ 1♂ 4.vi.2000.

***Junonia orithya* (Linnaeus, 1758)** (fig. 2). Khuzestan Province: Ahvaz, more than 130 specimens which were collected from 1985 to 2017; Shushtar, 1♀ 4.iv.2016, Mollasani, 1♀ 28.viii.1967, 2♀ 23.x.2002, 1♀ 2.xi.2002, 1♂ 3.xi.2002, 1♀ 17.xi.2002, 1♀ 1.v.2003, 1♂ 25.iv.2004; Khorramshahr, 1♀ 10.ix.2013, Dezful, 1♀ 23.x.1985, 1♀ 26.iii.2012, 1♂ 1.xi.2013; Andimeshk, 1♂ 15.x.2002; Behbahan, 1♀ 17.xi.2002; Haft Tappeh, 1♂ 2.viii.2011, 1♀ 2.iv.2011, 1♂ 3.v.2012, 1♀ 11.x.2012; Gotvand, 1♀ 31.x.1990; Shush, 2♀ 5.iv.2017, 1♀ 15.iv.2017; Baghmalek, 1♀ 4.xi.2015, Ramhormoz, 1♀ 6.xi.1990; Fars Province: Shiraz, 1♂ 12.iv.2007; Kerman Province: Sirjan, 1♂ 1♀ 21.ix.2012, 1♀ 23.ix.2012; Rafsanjan, 1♀ 10.v.2017; Esfahan Province: Esfahan, 1♀ 5.vi.2009, 1♀ 1.ii.2010, Chaharmahal-va Bakhtiari Province: Shahrekord, 1♀ 25.v.2010, 1♂ 21.i.2014; Yazd Province: Yazd, 13♀ 1♂ 15.ix.2012; Khorasan-e Razavi Province: Mashhad, 1♂ 21.iii.1968, 1♀ 9.iv.2001, 1♀ 10.v.2010; Mazandaran Province: Ramsar, 1♂ 17.iii.1965, 1♀ 14.i.1995.

Note. This taxon is new to the Yazd and Khorasan-e Razavi Provinces.

***Vanessa atalanta* (Linnaeus, 1758).** Khuzestan Province: Ahvaz, 1♂ 11.iv.1968, 1♀ 1.xi.2002, 1♀ 1♂ 10.v.2003, 1♀ 2.iii.2004, 1♀ 1♂ 27.vii.2004, 1♂ 31.i.2013, 2♂ 2.iii.2013, 1♂ 17.iv.2013, 1♂ 5.iv.2016, 1♂ 6.iv.2017; Dezful, 1♂ 26.iii.2012; Mazandaran Province: Ramsar, 1♂ 16.iii.1965, 1♂ 14.i.1995.

***Vanessa cardui* (Linnaeus, 1758).** Khuzestan Province: Ahvaz, more than 400 specimens which were collected from 1964 to 2017; Dezful, 1♀ 29.i.1968, 1♂ 28.ii.1988, 1♂ 26.xi.1987, 1♀ 27.v.1991, 1♀ 11.xi.1994; Ramhormoz, 1♀ 1♂ 24.iii.2013; Mollasani, 1♀ 1♂ 27.x.1964, 1♂ 16.iii.1965, 1♀ 29.iii.1965, 1♂ 29.iii.1965, 1♂ 1.iv.1965, 1♀ 5.iv.1965, 1♂ 25.i.1966, 1♀ 11.iv.1966, 1♀ 7.iv.1966, 1♂ 5.v.1966, 1♀ 1♂ 1.iv.1967, 1♀ 1♂ 17.iv.1967, 1♀ 6.vii.1967, 1♀ 22.iii.1968, 1♂ 2.iv.1968, 1♀ 6.iv.1968, 1♀ 9.iv.1968, 1♂ 19.iv.1968, 2♀ 20.iv.1968, 1♀ 1♂ 23.iv.1968, 1♂ 17.v.1968, 1♀ 1.vi.1968, 1♀ 15.x.1969, 1♀ 12.iv.1970, 2♀ 28.xi.1971, 2♀ 1.xi.1985, 1♂ 9.iv.1987, 1♂ 20.iv.2011; Masjed Soleyman, 2♂ 23.iii.2014, 1♂ 1♀ 24.iii.2014; Baghmalek, 1♀ 3.v.2013; Andimeshk, 1♀ 23.iv.2013; Shushtar, 1♂ 1.iv.2005, 1♂ 1♀ 24.v.2005, 1♀ 22.iii.2016; Shush, 1♂ 28.xi.1986; Khorramshahr, 1♂ 1.v.2013, 3♂ 6.v.2013; Behbahan, 1♂ 11.vii.1985; Khorasan-e Razavi Province: Mashhad, 3♀ 1♂ 4.iv.2001; Esfahan Province: Esfahan, 1♂ 6.ix.1966, 1♀ 3.viii.2009, 1♂ 1.iv.2010, 1♂ 2.iv.2010, 1♀ 21.vii.2013; Fars Province: Shiraz, 1♂ 23.v.2005, 1♀ 29.v.2011; Marvdasht, 1♀ 5.viii.2012; Lorestan Province: Aligudarz, 1♂ 14.v.2011; Kerman Province: Sirjan, 1♀ 19.ii.2011, 1♂ 21.ix.2012; Ilam Province: Dehloran, 1♂ 18.iv.2014, 1♂ 25.iv.2014, 1♂ 28.iv.2014, 1♂ 4.v.2014, 1♂ 7.v.2014; Chaharmahal-va Bakhtiari Province: Shahrekord, 1♂ 27.iii.2013, 2♂ 1♀ 31.iii.2013; Lordegan, 1♂ 18.viii.2015, 1♂ 26.viii.2015.

***Hypolimnas misippus* (Linnaeus, 1764).** Khuzestan Province, 1♂ 24.vii.1988.

Note. This taxon is new to the Khuzestan Province.

***Aglais io* (Linnaeus, 1758).** 2♂ no data label.

***Aglais urticae* (Linnaeus, 1758).** Mazandaran Province: Ramsar, 1♀ 15.i.1995.

***Polygonia c-album* (Linnaeus, 1758).** 1♀ no data label.

***Nymphalis xanthomelas* ([Denis & Schiffermüller], 1775).** Tehran Province: Lavasan, 1♀ 20.i.1965.

***Melitaea gina* Higgins, 1941** (fig. 2). Lorestan Province: Aligudarz, 2♂ 15.v.2012; Khuzestan Province: 1♀ 7.vii.2011.

Note. This taxon is new to the Khuzestan Province.

***Melitaea persea* Kollar, 1849.** Khuzestan Province: Ahvaz, 1♂ 27.x.2013.

***Melitaea robertsi* Butler, 1880.** Fars Province: Shiraz, 2♀ 1♂ 5.v.2002.

***Danaus chrysippus* (Linnaeus, 1758)** (fig. 2). Khuzestan Province: Ahvaz, 1♀ 16.viii.1974, 3♀ 6.xii.1974, 1♂ 15.x.1984, 1♂ 6.xii.1984, 1♂ 19.v.1985, 1♂ 24.viii.1985, 1♂ 17.x.1985, 1♂ 31.x.1985, 1♂ 1.xi.1985, 1♀ 10.xi.1985, 1♀ 13.xi.1985, 1♂ 25.iv.1988, 1♂ 24.x.1988, 1♀ 8.x.1989, 1♀ 6.x.1990, 1♀ 5.vi.1990, 1♂ 14.x.1990, 1♀ 11.xi.1990, 2♀ 14.xi.1990, 1♂ 19.v.1995, 1♀ 24.v.1999, 1♂ 27.v.1999, 1♂ 2.xi.2002, 1♂ 8.xi.2002, 1♂ 11.xi.2002, 1♀ 22.iv.2003, 2♂ 29.iv.2003, 1♂ 8.v.2003, 1♂ 10.xi.2003, 1♀ 9.iv.2004, 1♀ 1♂ 24.ix.2004, 1♀ 12.x.2004, 1♀ 16.xi.2005, 1♀ 1♂ 24.xi.2005, 1♀ 22.iv.2006, 1♂ 24.iii.2007, 1♂ 3.vi.2007, 1♂ 22.iv.2008, 1♂ 1.v.2008, 2♂ 22.v.2008, 1♂ 2.x.2009, 1♀ 23.iv.2010, 2♀ 10.v.2010, 1♀ 1♂ 13.v.2010, 1♂ 26.v.2010, 1♀ 11.iv.2011, 1♂ 20.ix.2012, 1♂ 2.v.2013, 1♂ 26.x.2013, 1♂ 18.iv.2016; Khorramshahr, 1♂ 30.v.2013, 1♂ 9.vi.2013; Hendijan, 1♂ 11.xii.1987; Haft Tappeh, 1♀ 1.viii.2011; Dezful, 1♀ 31.iii.2008, 1♂ 20.x.2011, 1♂ 10.vi.2012; Mollasani, 1♂ 11.xi.1964, 1♂ 14.iii.1965, 1♀ 10.iv.1965, 3♀ 30.iii.1971, 1♂ 29.ix.1971, 1♀ 1♂ 22.x.1971, 1♂ 11.xi.1971, 1♀ 28.xi.971, 1♂ 31.xii.1971, 1♂ 2.i.1972, 1♀ 22.x.1972, 1♂ 21.xii.1972, 1♂ 29.xii.2000, 1♂ 2.xii.2002, 1♀ 31.iii.2008; Abadan, 1♂ 21.xi.1990, 2♂ 16.xi.2013; Shushtar, 1♀ 11.xi.1964, 1♂ 24.v.2005, 2♀ 10.v.2006; Kerman Province: Sirjan, 2♀ 5.v.2007, 1♂ 8.iv.2008, 1♂ 2.ix.2012; Jiroft, 1♂ 30.ix.2002; Esfahan Province: Esfahan, 1♀ 21.vii.2013; Kohgiluyeh-va Boyerahmad Province: Yasuj, 1♀ 24.vii.2012.

Note. This taxon is new to the Esfahan Province. Golestaneh *et al.* (2009) studied the life cycle of this species which damages *Calotropis procera* (Ait.) in the Bushehr Province, southern Iran.

***Coenonympha saadi* (Kollar, 1848).** Khuzestan Province: Baghmalek (Malagha), 1♀ 5.vi.2010; Izeh, 1♂ 2.vi.2010, Fars Province: Shiraz, 1♂ 5.v.2007.

***Kirinia climene* (Esper, 1783)** (fig. 2). Hamedan Province: Hamedan, 1♂ 25.v.2000; Khuzestan Province: Mollasani, 1♀ 16.v.1966; Tehran Province: Lavasan, 1♀ 1♂ 16.i.1965.

Note. This taxon is new to the Khuzestan Province.

***Lasiommata megera* (Linnaeus, 1767).** Khuzestan Province: Ahvaz, 1♀ 30.iv.2002, 1♀ 29.iv.2004, 1♀ 16.vi.2007, 1♀ 14.x.2016; Mollasani, 1♂ 5.v.2011; Fars Province: Shiraz, 1♂ 25.iv.2012; Lorestan Province: Aligudarz, 1♂ 12.viii.2011, 1♂ 1.ix.2013.

***Melanargia transcaspica* Staudinger, 1901.** 3♀ 1♂ no data label.

***Melanargia larissa lorestanensis* Carbonell & Naderi, 2007** (fig. 2). Khuzestan Province: Ahvaz, 1♂ 6.vii.2010, 3♀ 25.iv.2015.

Note. This taxon is new to the Khuzestan Province.

***Hipparchia turcmenica* (Heydemann, 1942).** 1♂ no data label.

***Hipparchia parisatis* (Kollar, 1849)** (fig. 2). Bushehr Province: Borazjan, 1♂ 26.xii.2006; Esfahan Province: Esfahan, 1♀ 12.vii.2009, 1♂ 19.vii.2009; Fars Province: Shiraz, 2♂ 25.xii.2004; Khuzestan Province: Izeh, 1♀ 22.x.2013, 1♀ 24.x.2013, 1♀ 1♂ 25.x.2013; Yazd Province: Yazd, 1♀ 24.iii.2012.

Note. This taxon is new to the Bushehr Province.

Hyponephele wagneri **(Herrich & Schäffer, [1846])** (fig. 2). Khuzestan Province: Ahvaz, 1♂ 29.iv.2003; Izeh, 1♂ 30.viii.2010; Fars Province: Shiraz, 1♀ 30.vii.2009; Yazd Province: Yazd, 1♀ 29.iii.2013; Kerman Province: Sirjan, 1♂ 21.ix.2012.

Note. This taxon is new to the Khuzestan Province.

Hyponephele lupina **(Costa, 1836).** Khuzestan Province: Ahvaz, 2♀ 2.v.2001, 1♂ 30.vii.2004; Kerman Province: Jiroft, 1♂ 4.v.2012, 2♂ 17.vii.2012, 1♂ 27.vii.2012; Alborz Province: Karaj, 3♂ 29.iv.2001; Dezful, 1♀ 16.vii.1994, 1♀ 13.v.2007; Mollasani, 1♀ 3.v.1968; Shush, 1♂ 26.iv.2012; Fars Province: Fasa, 1♂ 28.vii.2004; Esfahan Province: Esfahan, 1♀ 6.vii.2011; Khorasan-e Razavi Province: Mashhad, 3♀ 10.v.2001; Lorestan Province: Kuhdasht, 1♀ 6.viii.1984, 1♂ 7.viii.1984; Khorramabad, 1♂ 29.vii.1984, 2♀ 8.viii.1984, 2♀ 17.viii.1984, 1♀ 27.ii.2014.

Brintesia circe **(Fabricius, 1775).** 1♂ no data label.

Chazara briseis **(Linnaeus, 1764).** Khuzestan Province: Ahvaz, 1♀ 13.iii.2011, 1♂ 1.ix.2013, 1♂ 24.vii.2015; Lorestan Province: Khorramabad, 1♂ 28.iii.2015; Borujerd, 1♀ 2.viii.1984; Aligudarz, 2♀ 15.v.2012, 1♀ 3.vii.2013; Kuhdasht, 1♂ 13.viii.1984; Fars Province: Shiraz, 1♂ 1♀ 25.viii.2009, 1♂ 29.vi.2011, 1♀ 19.vii.2014; Khorasan-e Razavi Province: Mashhad, 2♀ 10.v.2001; Esfahan Province: Esfahan, 1♀ 11.iv.2006, 1♂ 24.v.2009; Chaharmahal-va Bakhtiari Province: Shahrekord, 1♀ 31.iii.2013, 1♂ 27.vii.2013; Lordegan, 1♂ 24.vii.2015, 1♂ 18.viii.2015.

Chazara persephone **(Hübner, [1805]).** Fars Province: Shiraz, 1♀ 1♂ 1.viii.2001; Kerman Province: Sirjan, 1♂ 9.ix.2012.

Chazara enervata **(Staudinger, 1881).** Khorasan-e Razavi Province: Mashhad, 2♀ 10.v.2001.

Pseudochazara pelopea **(Klug, 1832).** Khuzestan Province: Ahvaz, 1♀ 25.v.1968, 1♂ 25.iv.2015.

Pseudochazara thelephassa **(Geyer, [1827]).** Khuzestan Province: Ahvaz, 1♀ 19.x.2017; Lorestan Province: Khorramabad, 1♂ 28.iii.2015; Aligudarz, 1♀ 27.viii.2015; Fars Province: Shiraz, 1♀ 5.v.1988, 1♀ 2.iv.2001, 1♀ 10.ii.2005; Tehran Province: Tehran, 1♂ 25.v.1967; Kermanshah Province: Kermanshah, 1♂ 24.iii.2015; Kohgiluyeh-va Boyerahmad Province: Yasuj, 1♀ 3.ix.2012; Hamedan Province: Hamedan, 1♀ 25.v.2000.

Maniola jurtina **(Linnaeus, 1758).** Hamedan Province: Hamedan, 1♂ 29.iv.2000; Alborz Province: Karaj, 1♂ 30.iv.2001; Golestan Province: Gorgan, 1♀ 30.iv.1964.

Maniola telmessia **(Zeller, 1847).** Khuzestan Province: Andimeshk, 1♀ 1♂ 3.v.2007, 7♂ 27.iv.2018.

Discussion

Among the identified taxa in our study, 49 taxa were recorded from the Khuzestan Province, from which 11 taxa were new to the fauna of this province. According to the present study and review of the available literature (e.g. Modarres Awal 2002, Nazari 2003, Mossadegh & Kocheili 2003, Naderi 2012), 87 taxa of butterflies have been recorded from the Khuzestan province.

Apart from the interesting books of Nazari (2003) and Naderi (2012), most of the researches on butterflies in Iran have been performed by agricultural entomologists who usually investigate economic aspects of this insect group (Afshar 1946, 1947, Davatchi 1949 and Golestaneh *et al.* 2009). Meanwhile, the third author (A. Naderi) is publishing a field guide in Persian which will contain 438 species of Iranian butterflies including their photographs.

Our results indicate that, despite quite well-known information about the butterflies in Iran, their detailed distribution and taxonomic status may be further supplemented and revised by conducting more research into the explicit species diversity in each region. Research on the larval foodplant, early stages and life cycle of the taxa is needed as well. For this purpose, there is a good potential for research on butterflies at Iranian universities by postgraduate students which must be considered.

Acknowledgements

The authors wish to thank all the student collectors who helped to establish the IMCA at the Shahid Chamran University of Ahvaz. We also thank Dr. Amir Cheraghi for providing material of *P. thrax* from sugarcane fields. This study was financially supported by the Shahid Chamran University of Ahvaz.

References

Afshar J. 1946. Catalogue des Rhopalocères de l'Iran. — *Entomologie et Phytopathologie Appliquées* **1/2**: 6–7; 29–3. (Persian, French)

Afshar J. 1947. Liste des Rhopalocères de l'Iran. (continued). — *Entomologie et Phytopathologie Appliquées* **3**: 46–48. (Persian, French)

Cock M.J. W. 2009. Observations on the biology of *Pelopidas thrax* (Hübner) (Lepidoptera: Hesperiidae: Hesperiinae) in the Hajar Mountains, Oman. — *Tribulus* **18**: 42–49.

Davatchi A. 1949. *Important pests of field crops and their control*. — Ministry of Agriculture, Tehran, 296 pp.

Farahbakhsh Gh. 1961. *A Checklist of economically important insects and other enemies of plants and agricultural products in Iran*. — Plant Organization Press, Iran, 153 pp.

Golestaneh S.R., Askari H., Goldasteh Sh., Dousti Mozaffari A. & Farrar N. 2009. A study on the life cycle of *Danaus chrysippus* Linnaeus (Lep.: Nymphalidae) in Bushehr, Iran. — *Journal of Entomological Research* **1**(1): 1–11.

Jowkar H., Ostrowski S., Tahbaz M. & Zahler P. 2016. The Conservation of Biodiversity in Iran: threats, challenges and hopes. — *Iranian Studies* **49**(6): 1065–1077.
Khanjani M. 2005. *Vegetable pests in Iran*. 1st Ed. — Bu-Ali Sina University Press, 467 pp.
Khanjani M. 2009. *Field crop pests in Iran*. 5th Ed. — Bu-Ali Sina University Press, 720 pp.
Kristensen N.P., Scoble M.J. & Karsholt O. 2007. Lepidoptera phylogeny and systematic: the state of inventorying moth and butterfly diversity. — *Zootaxa* **1668**: 699–747.
Ménétriès E. 1832. Catalogue raisonné des objets de zoologie, recueillis dans un voyage au Caucase et jusqu'aux frontières actuelles de la Perse, enterpris par ordre de S.M. l'Empereur. — *Bulletin de l'Académie impériale des sciences de St.-Pétersbourg* XXVIII, XXIX, XXXII, 241–268.
Modarres Awal M. 2002. *List of agricultural pests in Iran and their natural enemies*. — Ferdowsi University, Iran, 364 pp. (in Persian)
Mossadegh M.S. & Kocheili F. 2003. *A semi descriptive checklist of identified species of arthropods (agricultural, medical, …) and other pests from Khuzestan, Iran*. — Shahid Chamran University Press, Ahvaz, 475 pp.
Naderi A. 2012. *The field guide of butterflies of Iran*. — Iranshenasi Publications, Tehran, 272 pp.
Nazari V. 2003. *Butterflies of Iran*. Department of Environment. — Dayereye-Sabz Publications, Tehran, 568 pp.
Scoble M.J. 1992. *The Lepidoptera: form, function and diversity*. — Oxford University Press, Oxford, 400 pp.
Taherkhani K. 2016. *Pests and disease of sugarcane in Iran and their management*. —Kerdegar Publications, Ahvaz, 352 pp.
Tshikolovets V.V., Naderi A. & Eckweiler W. 2014. *The Butterflies of Iran and Iraq*. —Tshikolovets Publications, 440 pp.
van Nieukerken E., Kaila L., Kitching I., Kristensen N.P., Lees D., Minet J., Mitter J., Mutanen M., Regier J., Simonsen T. Wahlberg N., Yen S.-H., Zahiri R., Adamski D., Baixeras J., Bartsch D. Bengtsson B. Å., Brown J.W., Bucheli S.R., Davis D.R., De Prins J., De Prins W., Epstein M.E., Gentili-Poole P., Gielis C., Hättenschwiler P., Hausmann A., Holloway J.D., Kallies A., Karsholt O., Kawahara A.Y., Koster S.J.C., Kozlov M.V., Lafontaine J.D., Lamas G., Laundry J.F. Lee S., Nuss M., Park K.-T., Penz C. Rota J., Schintlmeister A., B.C. Schmidt, Sohn J.-C., Solis M.A., Tarmann G.M., Warren A.D., Weller S., Yakovlev R.V., Zolotuhin V.V. & Zwick A.
2011. Order Lepidoptera Linnaeus, 1758. — *Zootaxa* **3148**: 212–221.
Wiemers M., Balletto E., Dincă V., Fric Z.F., Lamas G., Lukhtanov V., Munguira M.L., van Swaay C.A.M., Vila R., Vliegenthart A., Wahlberg N. & Verovnik R. 2018. An updated checklist of the European Butterflies (Lepidoptera, Papilionoidea). — *ZooKeys* **81**: 9–45.

Impatiens glandulifera as a commonly used host plant for *Pristerognatha fuligana* (Lepidoptera: Tortricidae) in Belgium

Ruben Meert & Regis Nossent

Abstract. In autumn 2018 several full-grown larvae of *Pristerognatha fuligana* (Denis & Schiffermüller, 1775) were found in stems of *Impatiens glandulifera* (Indian balsam), an invasive plant species. Until then this species was only known to feed on *Impatiens noli-tangere* (touch-me-not balsam) in Belgium. Information about these observations and about the biology of *P. fuligana* is provided.

Samenvatting. In de herfst van 2018 werden verschillende volgroeide rupsen van *Pristerognatha fuligana* (Denis & Schiffermüller, 1775), springzaadbladroller, gevonden in stengels van *Impatiens glandulifera* (reuzenbalsemien), een invasieve plantensoort. Tot dan toe was de soort in België enkel bekend van *Impatiens noli-tangere* (groot springzaad). In dit artikel wordt informatie gegeven over deze waarnemingen en over de biologie van *P. fuligana*.

Résumé. Pendant l'automne de 2018 plusieures chenilles de *Pristerognatha fuligana* (Denis & Schiffermüller, 1775) ont été découvertes dans des tiges d'*Impatiens glandulifera* (Balsamine de l'Himalaya) qui est une plante invasive. Jusqu'à ce moment, toutes les chenilles de cette espèce trouvée en Belgique se nourrissaient d'*Impatiens noli-tangere* (Balsamine des bois). Dans cet article on donne des informations concernant ces observations et la biologie générale de *P. fuligana*.

Key words : *Pristerognatha fuligana* – *Impatiens glandulifera* – *Impatiens noli-tangere* – Tortricidae – Lepidoptera - Belgium.

Meert R.: Grote Snijdersstraat 75, 9280 Lebbeke, Belgium, ruben_meert@hotmail.com
Nossent R.: Florastraat 96, 9050 Gentbrugge, Belgium, nossent_regis@yahoo.com

Introduction

The tortricid moth *Pristerognatha fuligana* (Denis & Schiffermüller, 1775) is known to be a very rare species in Belgium (De Prins *et al.*, waarnemingen.be 2019). Until October 2018 Waarnemingen.be, the data portal of the NGO Natuurpunt for nature observations by citizen scientists, contained thirty reported specimens. Twenty-one of them were caterpillars found by the first author in stems of their host plant *Impatiens noli-tangere* (touch-me-not balsam). Adult moths, nine in all, were mostly observed in the field. Only one of them was caught using a light trap (waarnemingen.be 2019).

In autumn 2018, several larvae were found in stems of *Impatiens glandulifera* (Indian balsam). Very little information is available on *I. glandulifera* being a host plant for *Pristerognatha fuligana*.

Fig. 1. *P. fuligana* (adult) resting on *I. glandulifera* leaf – Mechelen (AN) 08.vi.2016 © Olivier Fuchs.
Fig. 1. *P. fuligana* (adult) rustend op blad van *I. glandulifera* – Mechelen (AN) 08.vi.2016 © Olivier Fuchs.

Distribution

Pristerognatha fuligana occurs in most countries of Central and Western Europe and has a more scattered distribution in Northern and Eastern Europe. It has not been observed in Great Britain nor in G. D. Luxembourg (Aarvik 2013). In Belgium it is known from six Provinces (OV, AN, VB, BW, NA and LG) (De Prins *et al.* 2019), but it might be overlooked. Outside Europe it is present in Kazakhstan, Siberia, some Far East Russian regions and the Japanese islands Hokkaido and Honshu (Razowski 2003).

Impatiens glandulifera is an invasive plant species (Van de Meutter *et al.* 2012) originating in the Himalayas, especially in Tibet and India. It was introduced in Europe in the middle of the 19th century as an ornamental plant (Burkhart & Nentwig 2008) and it soon started spreading into the wild. Since 1915 it has been considered as an invasive pest, occurring now in most parts of Western Europe (Kesters & Gorissen 2010).

Observations on Impatiens glandulifera

On 7 October 2018 the second author went on a field trip to search for larvae of *Pristerognatha fuligana* in Mechelen (AN), more specifically in the Nature Reserve 'Battenbroekbos'. In this wet forest, managed by the Agency for Nature and Forests of the Flemish Government, an adult specimen was seen on August 6, 2016 (waarnemingen.be 2019).

Inspired by the observations of larvae in *Impatiens noli-tangere*, the second author searched without success for decaying stems of this plant. This is in accordance with the distribution map of *I. noli-tangere*, which – apparently – has never been seen in the Battenbroekbos (table 1) (waarnemingen.be 2019). On the other hand, *Impatiens glandulifera* is very abundant there.

Table 1. Observations of *P. fuligana* larvae in stems of *I. glandulifera* from 07.x.2018–22.ix.2019.
Table 1. Waarnemingen *P. fuligana* rupsen in stengels van *I. glandulifera* van 07.x.2018–22.ix.2019.

Province	Municipality	Area	Date	Observer	#
Antwerpen	Mechelen	Battenbroekbos	07.x.2018	R. Nossent	3
			10.x.2018	R. Nossent	3
			17.iv.2019	R. Nossent	2
	Puurs-Sint-Amands	Liezele	10.x.2018	R. Meert	4
	Willebroek	Blaasveld	2.xi.2018	R. Nossent	1
		Biezenweiden	18.xi.2018	R. Nossent	3
Oost-Vlaanderen	Dendermonde	Vlassenbroek	10.x.2018	R. Meert	2
			22.ix.2019	R. Meert	1
		Sint-Gillis-bij-Dendermonde , Oud Klooster	11.xi.2018	R. Meert	1
	Lebbeke	Wachtbekken Fochel	13.x.2018	R. Meert	1
	Aalst	Erembodegem , Gerstjens	16.x.2018	R. Meert	1
	Berlare	Uitbergen, Nieuwdonk	17.x.2018	R. Meert	2
			12.viii.2019	R. Meert	2
	Lebbeke	Dorp	29.i.2019	R. Meert	1
		Heizijde	31.vii.2019	R. Meert	1
Luxemburg	Bouillon	Sensenruth	08.iii.2019	R. Meert	2
Namen	Vresse-sur-Semois	Laforêt	13.ix.2019	R. Nossent	3

Fig. 2. Discoid webs of *P. fuligana* in a stem of *I. noli-tangere*, visible from the outside – Brakel (OV) 13.ix.2017 © Ruben Meert.
Fig. 2. Schijfvormige spinsels van *P. fuligana* in een stengel van *I. noli-tangere*, zichtbaar vanaf de buitenzijde – Brakel (OV) 13.ix.2017 © Ruben Meert.

So why not have a quick look? The first plant already showed typical feeding signs of *P. fuligana* and immediately a larva was found fairly high up in the stem. At the end of the search, three larvae were found. Afterwards it turned out that the adult moth from August 2016 in that location, on which this search was based, was photographed at rest on a leaf of *Impatiens glandulifera* (fig. 1).

Having been informed about these remarkable findings, the first authoralso began searching for larvae of *P. fuligana* in *I. glandulifera*. Between October 10, 2018 and September 22, 2019 several locations in the valley of the rivers Dender and Scheldt in the Provinces of East-Flanders and Antwerp were investigated. In the meantime, the second author went on searching in the Province of Antwerp. In every location at least one larva was found, 33 in all (Table 1).

Nineteen infested stems of *I. glandulifera* were collected and kept in moist sand in jars that were placed indoors from January onwards. Only two of them produced adult moths, on 14 April and 7 May 2019 (fig. 8). Both individuals were collected in early spring. None of the larvae that were collected in the period October 2018 – January 2019 reached adulthood: all were found dried out in the stem.

Observations of larvae of *P. fuligana* in *I. glandulifera* are extremely rare. Only two references were found. Burkhart & Nentwig (2008) mention personal observations in Switzerland. In Sweden there is at least one reliable report of a larva that was collected and bred in February-March 2017 (pers. comm. Stefan Lemurell, Artportalen.se 2019).

Biology

The larvae of *P. fuligana* complete their development endophagously within the stems of *Impatiens noli-tangere* and *I. glandulifera*. Several discoid webs, in which frass is incorporated – are made – sometimes in the hollow nodes, each closing off part of the stem (fig. 3 & 5).

Based on the observations by the first author, larvae found in *I. noli-tangere* live at the base of the stem just above ground level or sometimes even in the roots. Both authors found a different behaviour in *I. glandulifera*: only 1 larva out of 33 was found at the base of the stem. All the others lived much higher in the plant.

This might be because a difference in diameter of the stems of *I. glandulifera*. Compared to those of *I. noli tangere* most of them are much thicker. Possibly the larva

Fig. 3. Larva and webs of *P. fuligana* in stem of *I. glandulifera* – Uitbergen (OV) 12.viii.2019 © Ruben Meert.
Fig. 3. Rups en spinsel van *P. fuligana* in stengel van *I. glandulifera* – Uitbergen (OV) 12.viii.2019 © Ruben Meert.

Fig. 4. Shaded habitat with infested plants of *I. glandulifera* – Vlassenbroek (OV) 10.x.2018 © Ruben Meert.
Fig. 4. Beschaduwde groeiplaats met bezette planten van *I. glandulifera* – Vlassenbroek (OV) 10.x.2018 © Ruben Meert.

'fits' better in the rather narrow stems of *I. noli-tangere*. In *I. glandulifera* the base of the stem might be too broad, but higher up the stem becomes thinner and possibly more suitable to inhabit. Another explanation can be the energy used to produce the discoid webs inside: more silk and time are needed to close off a broader stem.

I. noli-tangere needs moisture and shade. Nearly all infested *I. glandulifera* plants were growing in very similar situations (fig. 4). One infested plant was fully exposed to sunlight and found in a reed bed near the River Scheldt.

Pupation takes place within the larval habitat. Before hatching, the pupa protrudes from the stem through a prepared exit hole (fig. 6). Adults are on the wing between late April and August, suggesting two generations a year (Razowski 2003).

Apparently all previous search efforts for larvae in Belgium were made in autumn. The collected larvae always hibernate inside the decaying stems of the host plant, producing moths the following spring. Waarnemingen.be (2019) shows that most adult moths were seen in May and June. Despite one observation of an adult moth in August, the existence of a (perhaps partial) second generation needs to be confirmed in Belgium.

Field search tips

Burkhart & Nentwig (2008) concluded that there are no external signs, such as distorted growth or discoloration, indicating the presence of a larva inside a stem of *I. glandulifera* stem. Personal observations by both authors lead to the same conclusion, at least on large *I. glandulifera* plants. In one small, slender infected plant, wilting was clearly noticeable (fig. 7).

In *I. noli-tangere*, stems become translucent while decaying in autumn. The discoid webs inside the base of the stem are then often visible from the outside while looking against direct sunlight (fig. 2). This technique does not seem to work so well with *I. glandulifera* stems, and it is necessary to split open the whole stem to check for the presence of webs and a larva.

Finding an infested *I. glandulifera* stem was easier in shaded areas: plants there were growing less densely than those plants in sunny conditions and the infestation rate seemed higher. The larva is pale greenish with a light brown head and prothoracic plate (Razowski 2003).

In Europe, another species of *Pristerognatha* occurs, *P. penthinana* (Guenée, 1845), which also uses *I. noli-tangere* as a host plant. It has a more or less similar distribution to that of *P. fuligana,* but is also known from some South European countries and North America and it is the only *Pristerognatha* species recorded from Great Britain (Razowski 2003), where it was known from the Lake District, but has not been seen since 1914 and is thought to be extinct (Barry Goater pers. comm.). It's a very rare species in Belgium, with only a few old records in the Province of Brabant before 1980 (De Prins *et al*. 2019). Larvae are rather pale yellowish grading into bright canary yellow posteriorly with a blackish head and black thoracic plate (Bland 2014). In case of doubt, both species can be distinguished from each other by looking at the abdomen and cremaster of the pupa (see lepiforum.de 2019, the German web portal of Lepiforum e. V. for more details). In places where this species is known to occur, it might be interesting to look for its larvae too, in stems of *I. glandulifera*.

Because of the softness of the stems of *I. noli-tangere*, they start to decay in early autumn, and hence locating dead stems in winter or spring is quite difficult (Schütze 1931, confirmed by personal observations). Therefore, a good time to search for larvae in this plant is autumn. Stems of *I. glandulifera*, however, are evidently more

Fig. 5. Infested stem of *I. glandulifera* with web (left) and larva of *P. fuligana* – Mechelen (AN) 07.x.2018 © Regis Nossent.
Fig. 5. Bezette stengel van *I. glandulifera* met spinsel (links) en rups van *P. fuligana* – Mechelen (AN) 07.x.2018 © Regis Nossent.

Fig. 8. *P. fuligana*, imago e.l. 07.v.2019, bred from larva in *I. glandulifera* – Mechelen (AN) 17.iv.2019 © Regis Nossent
Fig. 8. *P. fuligana*, imago e.l. 07.v.2019, gekweekt uit rups in *I. glandulifera* – Mechelen (AN) 17.iv.2019 © Regis Nossent

Fig. 6. *P. fuligana*, exuvium e.l. 10.v.2019, larva in *I. noli-tangere* – Jalhay (LG) 30.IX.2018 © Ruben Meert
Fig. 6. *P. fuligana*, exuvium e.l. 10.v.2019, rups in *I. noli-tangere* – Jalhay (LG) 30.IX.2018 © Ruben Meert

Fig.7. Infested and wilting *I. gladulifera* plant – Uitbergen (OV) 12.viii.2019 © Ruben Meert
Fig. 7. Aangetaste en verwelkende *I. gladulifera* plant – Uitbergen (OV) 12.viii.2019 © Ruben Meert

robust and tend to dry out first instead of decaying immediately. This is certainly true in drier habitats and drier weather conditions. In *I. glandulifera*, larvae can be sought with success right up to early spring.

Breeding is easy with larvae found in late winter or spring: place the infested stems should be placed in a large jar, partially filled with some slightly moist sand and covered with some paper tissue: it can be left outdoors, or brought indoors to speed up development. Depending on the conditions under which they are kept, adult moths appear a few weeks or months later. Both authors had difficulties with breeding adult moths from larvae collected in autumn, probably due to a lack of moisture.

Discussion and conclusions

As the invasive *I. glandulifera* is a more common plant in Belgium than *I. noli-tangere* (waarnemingen.be 2019) and readily acceptable as a host plant, *P. fuligana* has the opportunity to expand its range in our country and possibly in Western Europe. This hypothesis is supported by the observations of both authors: on every investigated site with a population of *I. glandulifera*, larvae of *P. fuligana* were found.

The map with the combined observation data of *P. fuligana* and *I. noli-tangere* (January 1, 2000 – October 6, 2018) shows a few places where the moth occurs in habitats without the presence of its native host plant (fig. 9). In these locations, only adult moths have been observed. We suppose therefore that *I. glandulifera*, which does occur there, must be the host plant. The authors conclude that *P. fuligana* is more common than generally assumed, as it seems to be a species that doesn't come readily to light and can be easily overlooked: in spring and summer 2019 not a single observation of an adult moth was mentioned on waarnemingen.be (2019).

As the occurrence of a (possibly partial) second generation remains unconfirmed in Belgium, it would be interesting to look for larvae in fresh *Impatiens* stems in late spring or summer. To see whether they produce moths the same year, the infected living plants can be potted and put in a gauze cage in outdoors. On the other hand, to check the phenology, infested stems collected in autumn can be kept outdoors until late summer of the next year or until all the moths have emerged.

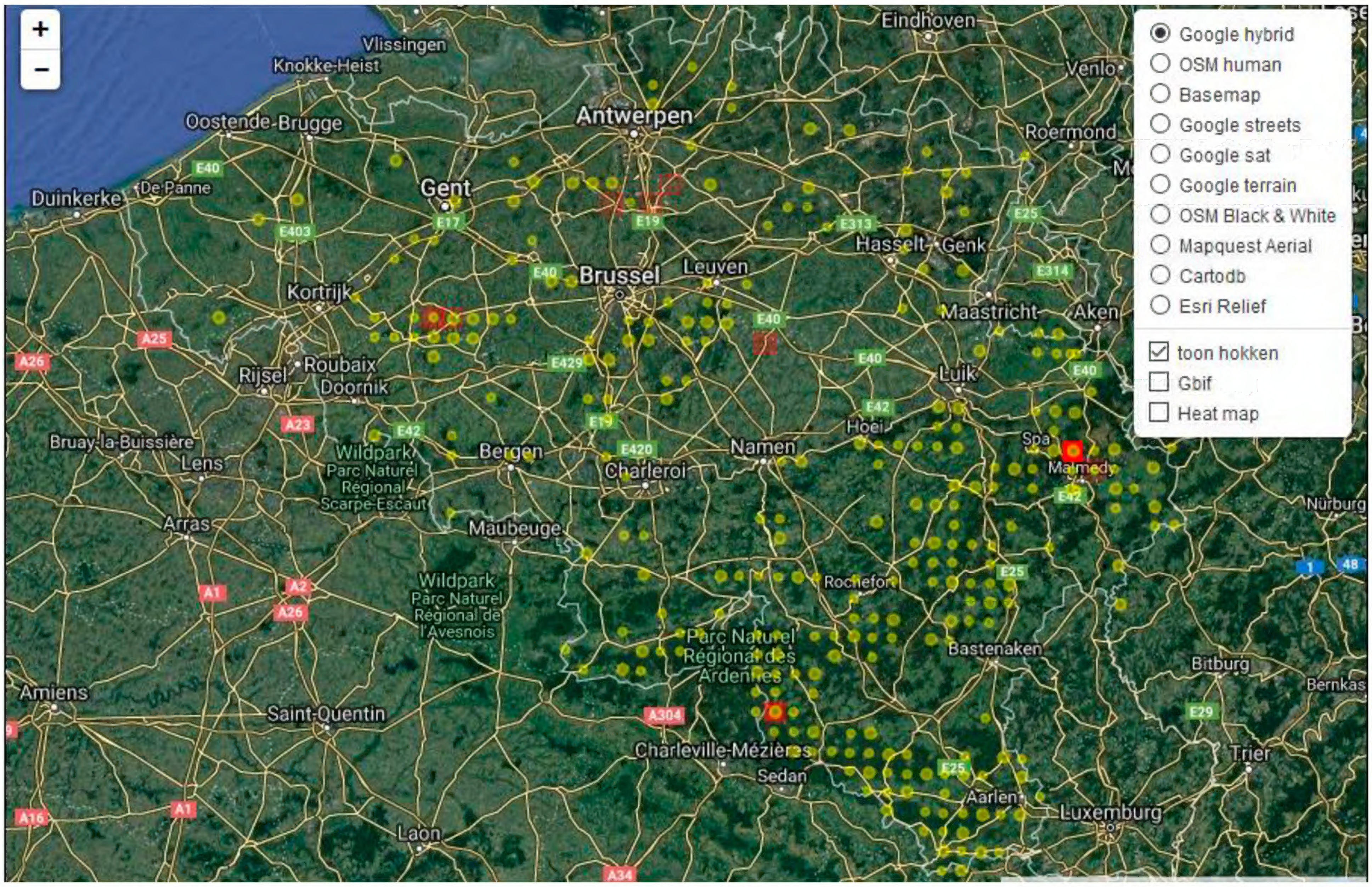

Fig. 9. Map with the combined observations of *P. fuligana* (red squares) and *I. noli-tangere* (yellow dots) in period 2000–2018 (waarnemingen.be 2019)
Fig. 9. Kaart met de gecombineerde waarnemingen van *P. fuligana* (rode vierkantjes) en *I. noli-tangere* (gele stippen) in de periode 2000–2018 (waarnemingen.be 2019)

Three more species of *Impatiens* occur in Belgium, none of which is originally native: *I. balfourii* (Kashmir balsam), *I. capensis* (orange balsam) and *I. parviflora* (small balsam) (waarnemingen.be 2019). When possible, they too should be checked for the presence of *P. fuligana* larvae.

Acknowledgements

We wish to thank Theo Garrevoet, Stéphane Claerebout and Barry Goater for correcting earlier drafts of this article. Special thanks to Marc Herremans for providing the map from waarnemingen.be. We're also very grateful to Wolfgang Nentwig and Stefan Lemurell for providing information about the observations in Sweden and Switzerland.

References

Aarvik L.E. 2013. *Fauna Europaea: Tortricidae.* – In: van Nieukerken E.J. & Karsholt O. (Eds), Fauna Europaea: Lepidoptera, Moths. - Fauna Europaea version 2017.06. — https://fauna-eu.org [accessed on 7.iii.2018].

Artportalen.se 2019. *Pristerognatha fuligana*. – https://www.artportalen.se/search/sightings/taxon/102484# [accessed on 16.i.2019].

Bland K.P. 2014. *The moths and butterflies of Great Britain and Ireland. Volume 5: Tortricidae*. — Brill, Leiden, 377 pp.

Burkhart K., Nentwig W. 2008. Control of *Impatiens glandulifera* (Balsaminaceae) by Antagonists in its Invaded Range. — *Invasive Plant Science and Management* **1**: 352–358.

De Prins W., Steeman C. & Garrevoet T. 2019. *Catalogue of the Lepidoptera of Belgium*. — https://projects.biodiversity.be/lepidoptera/ [accessed on 12.i.2019].

Kesters E., Gorissen A. 2010. Bestrijding van invasieve exoten: Reuzenbalsemien. *Ervaringsrapport gebiedsdekkende bestrijding 2010.* — Watering De Dommelvallei, Peer.

Lepiforum.de 2019. Bestimmungshilfe: *Pristerognatha fuligana* — http://www.lepiforum.de/lepiwiki.pl?Pristerognatha_Fuligana [accessed on 17.i.2019].

Razowski J. 2003. *Tortricidae of Europe Volume 2.* — František Slamka, Bratislava, Slovakia, 301 pp.

Schütze K.T. 1931. *Die Biologie der Kleinschmetterlinge unter besonderer Berücksichtigung ihrer Nährpflanzen und Erscheinungszeiten. Handbuch der Microlepidopteren. Raupenkalender geordnet nach der Illustrierten deutschen Flora von H. Wagner.* — Frankfurt am Main (Verlag des Internationalen Entomologischen Vereins e.V.).

Van de Meutter F., Vanderhaeghe F., Raman M. & Van Kerckvoorde A. 2012. Invasieve uitheemse planten langsheen bevaarbare waterlopen in West- en Oost-Vlaanderen. Inschatting van het voorkomen en een afwegingskader voor beheer. *Rapporten van het Instituut voor Natuur- en Bosonderzoek 2012 (INBO.R.2012.13).* — Instituut voor Natuur- en Bosonderzoek, Brussel.

Waarnemingen.be 2019. *De website voor natuurinformatie van Stichting Observation International, Natuurbank Nederland (NBNL) en Natuurpunt. Impatiens glandulifera*, *Impatiens noli-tangere* and *Pristerognatha fuligana*. — www.waarnemingen.be [accessed on 16.i.2019 and 13.viii.2019].